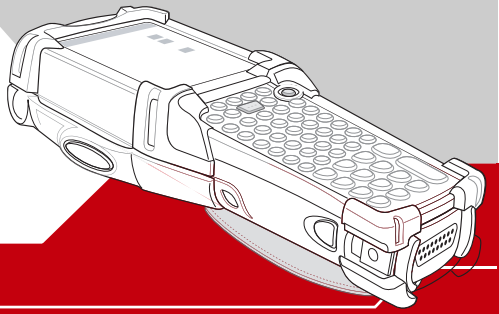
MC9000-K/S



Product Reference Guide

for Embedded Windows® CE .NET

symbol®

The Enterprise Mobility Company™

MC9000-K/S for Embedded Windows® CE .NET Product Reference Guide

72-65262-03
Revision A
June 2004

symbol®
The Enterprise Mobility Company ™

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Revision History

Changes to the previous manual are listed below:

Change	Date	Description
-01 to -02	1/15/04	Updated Operating system to Win CE 4.2. Added new screens and menus, Chapter 2 and Chapter 3.
		Updated Chapter 6, to include Mobile Companion upgrade from version 3.9.1 to version 3.9.2.
-02 to -03	6/18/04	Updated Chapter 3, to include new Bluetooth setup and to include new Power settings.
		Updated Chapter 6, to include additional Mobile Companion upgrades for version 3.9.2.
		Added new VCD9000 Vehicle Cradle to Chapter 7, Accessories.
		Added new MDM9000 Modem Module to Chapter 7, Accessories.

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Tell Us What You Think...

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Introduction

The *MC9000-K/S Product Reference Guide* provides information about the MC9000-K and MC9000-S mobile computers using the Embedded Windows® CE .NET operating system and its accessories. The MC9000-K and MC9000-S includes the following variations:

- MC9000-K: Windows® CE operating system performs 1-dimensional bar code scanning with batch communication; memory configuration (32 or 64) MB ROM/(32 or 64) MB RAM; 28-key, 43-key and 53-key interchangeable keypads; QVGA color touch panel display.
- MC9060-K: Windows® CE operating system performs 1-dimensional bar code scanning (models with an integrated laser scanner), or 1-dimensional and 2-dimensional bar code scanning (models with an integrated imager); 802.11b Spectrum24® wireless technology to perform wireless local area network (WLAN) communication; monochrome or QVGA color touch panel display; memory configuration (32 or 64) MB ROM/(32 or 64) MB RAM; 28-key, 43-key and 53-key interchangeable keypads.
- MC9000-S: Windows® CE operating system performs 1-dimensional bar code scanning with batch communication; memory configuration (32 or 64) MB ROM/(32 or 64) MB RAM; 28-key keypad; QVGA color touch panel display.
- MC9010-S: Windows® CE operating system performs 1-dimensional bar code scanning with integrated laser scanner; 802.11 Spectrum24® wireless technology to perform wireless local area network (WLAN) communication; memory configuration (32 or 64) MB ROM/(32 or 64) MB RAM; 28-key keypad; QVGA monochrome touch panel display.
- MC9060-S: Windows® CE operating system performs 1-dimensional bar code scanning with integrated laser scanner; 802.11b Spectrum24® wireless technology to perform wireless local area network (WLAN) communication; memory configuration (32 or 64) MB ROM/(32 or 64) MB RAM; 28-key keypad; monochrome or QVGA color touch panel display.

Chapter Descriptions

Topics covered in this guide are as follows:

- *Chapter 1, Getting Started* describes the mobile computer's physical characteristics, explains how to install and charge the batteries, explains how to replace the strap lanyard, and explains how to start the mobile computer for the first time.
- *Chapter 2, Operating the MC9000-K/S* explains how to use the mobile computer. This includes instructions for powering on and resetting the mobile computer, entering and scanning.
- *Chapter 3, Settings* explains how to adjust settings on the mobile computer.
- *Chapter 4, Communications* explains how to use Microsoft® ActiveSync™ for communications between the mobile computer and host computer.
- *Chapter 5, Applications* explains how to use the installed applications.
- *Chapter 6, Spectrum24 Network Configuration* explains how to configure the Spectrum24 wireless connection.
- *Chapter 7, Accessories* describes the mobile computer accessories, including setup and configuration.
- *Chapter 8, Software Installation* provides an overview of the Software Mobility Developer's Kit (SMDK) installation and its uses.
- *Chapter 9, AirBEAM Smart* explains how to set up the mobile computer to synchronize with a server using the AirBEAM Smart Client and AirBEAM Staging applications.
- *Chapter 10, Mobile Computer Configuration* describes how to use the Terminal Configuration Manager (TCM) and describes how to use the Initial Program Loader (IPL).
- *Chapter 11, Desktop Emulator* provides instructions for installing the desktop emulator on the host computer and using the desktop emulator as an aid in developing applications.
- *Chapter 12, Maintenance and Troubleshooting* provides information on proper mobile computer maintenance and troubleshooting.
- *Appendix A, Technical Specifications* includes the technical specifications and connector pin outs for the mobile computer.
- *Appendix B, Keypad Maps* provides the keypad mapping information for the mobile computer.

Notational Conventions

The following conventions are used in this document:

- "Mobile computer" refers to any Symbol terminal.
- "User" refers to anyone using an application on the terminal.
- *Italics* are used to highlight the following:
  - chapters and sections in this and related documents
  - dialog box, window and screen names
  - drop-down list and list box names
  - check box and radio button names
  - icons on a screen.
- **Bold** text is used to highlight the following:
  - key names on a keypad
  - button names on a screen.
- Bullets (•) indicate:
  - action items
  - lists of alternatives
  - lists of required steps that are not necessarily sequential.
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Documents and Software

The following documents provide more information about the MC9000-K and MC9000-S.

- *MC9000-G Quick Start Guide* (poster), p/n 72-63360-xx
- *MC9000-G Licensing, Patent and Regulatory Information*, p/n 72-65260-xx
- *Windows CE Help File for Symbol Terminals*, p/n 72E-38880-xx
- *UBC 2000 Quick Reference Guide* 70-33188-xx.
- *Symbol Mobility Developer Kit for .NET (SMDK for .NET),* available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s
- Symbol Windows CE SMDK for Series 9000, available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s
- eConnect software, available at: http://devzone.symbol.com
- ActiveSync software, available at the Microsoft web site: http://www.microsoft.com.

Service Information

If you have a problem with your equipment, contact the *Symbol Support Center* for your region. See page xxiii for contact information. Before calling, have the model number, serial number and several of your bar code symbols at hand.

Call the Support Center from a phone near the scanning equipment so that the service person can try to talk you through your problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of your bar codes for analysis at our plant.

If your problem cannot be solved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given specific directions.



Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to obtain a new shipping container.

Symbol Support Center

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

United States

Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300

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Sweden

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Sweden

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Tel: Call Center: +46 8 445 29 29 (international)

Support E-Mail: Sweden.Support@se.symbol.com

If the Symbol product was purchased from a Symbol Business Partner, contact that Business Partner for service.

For the latest version of this guide go to:http://www.symbol.com/manuals.

1 Getting Started

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Introduction

This chapter describes the mobile computer's physical characteristics, how to install and charge the batteries, replace the strap lanyard, remove and replace the stylus and start the mobile computer for the first time.

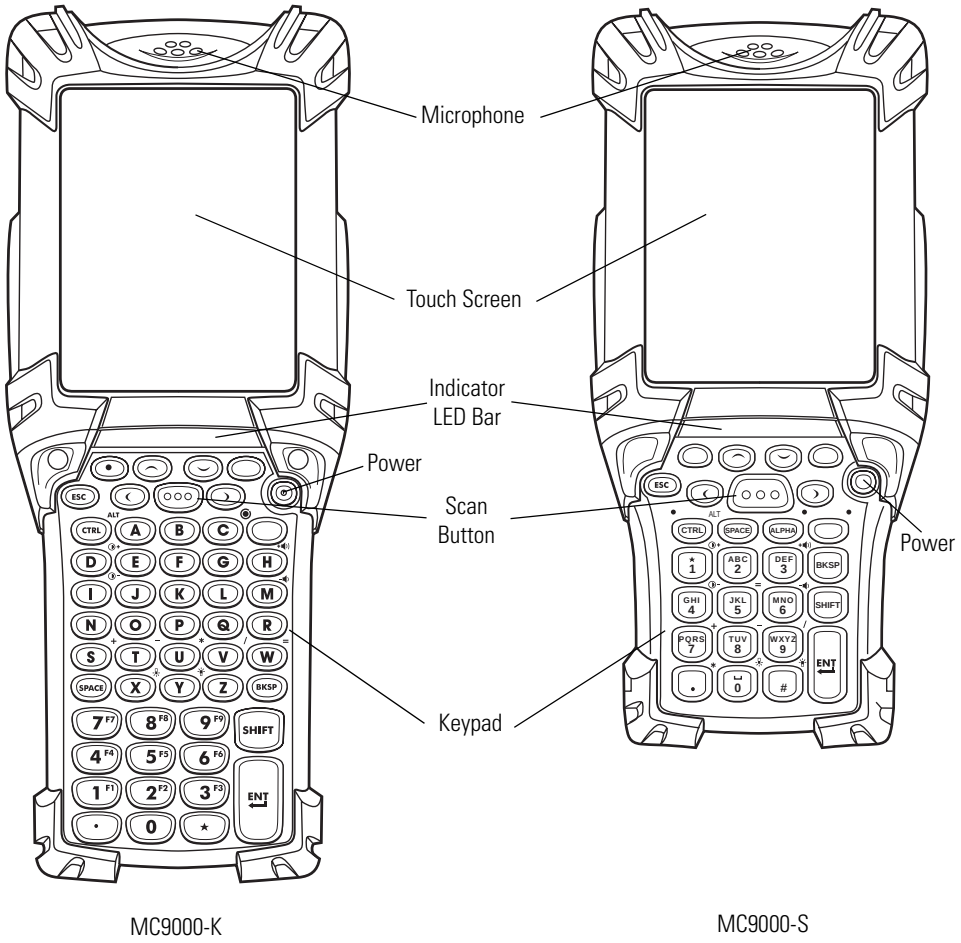


Figure 1-1. MC9000-K and MC9000-S: Front View

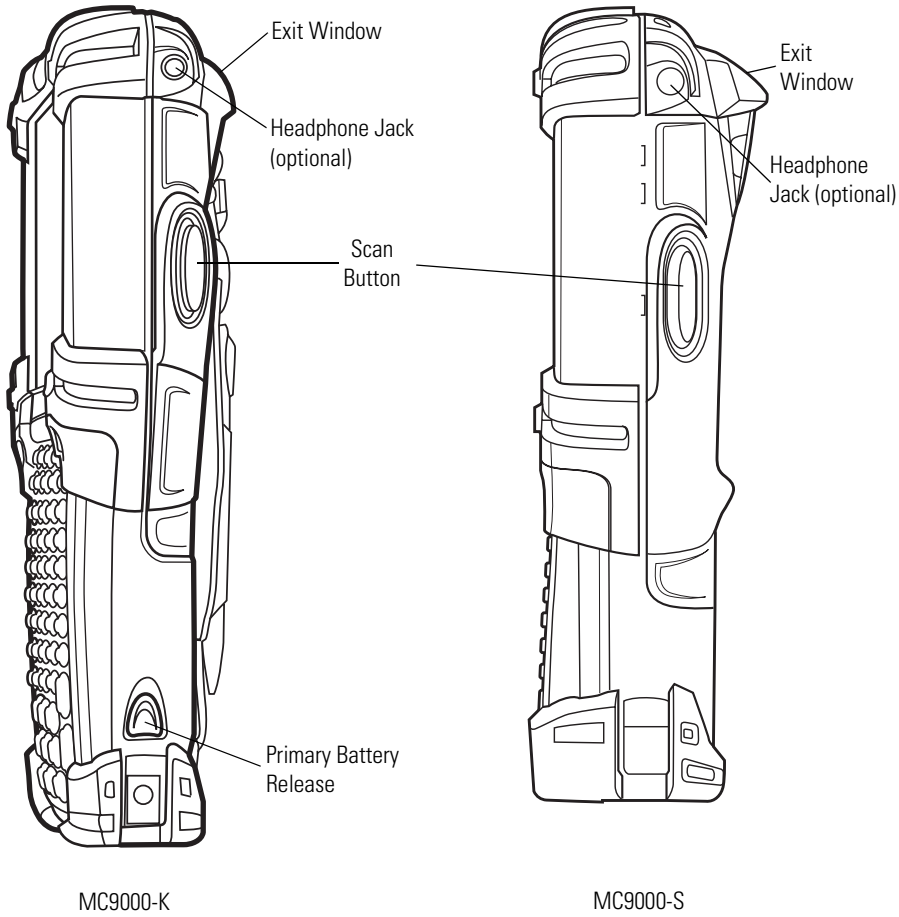


Figure 1-2. MC9000-K and MC9000-S: Side View

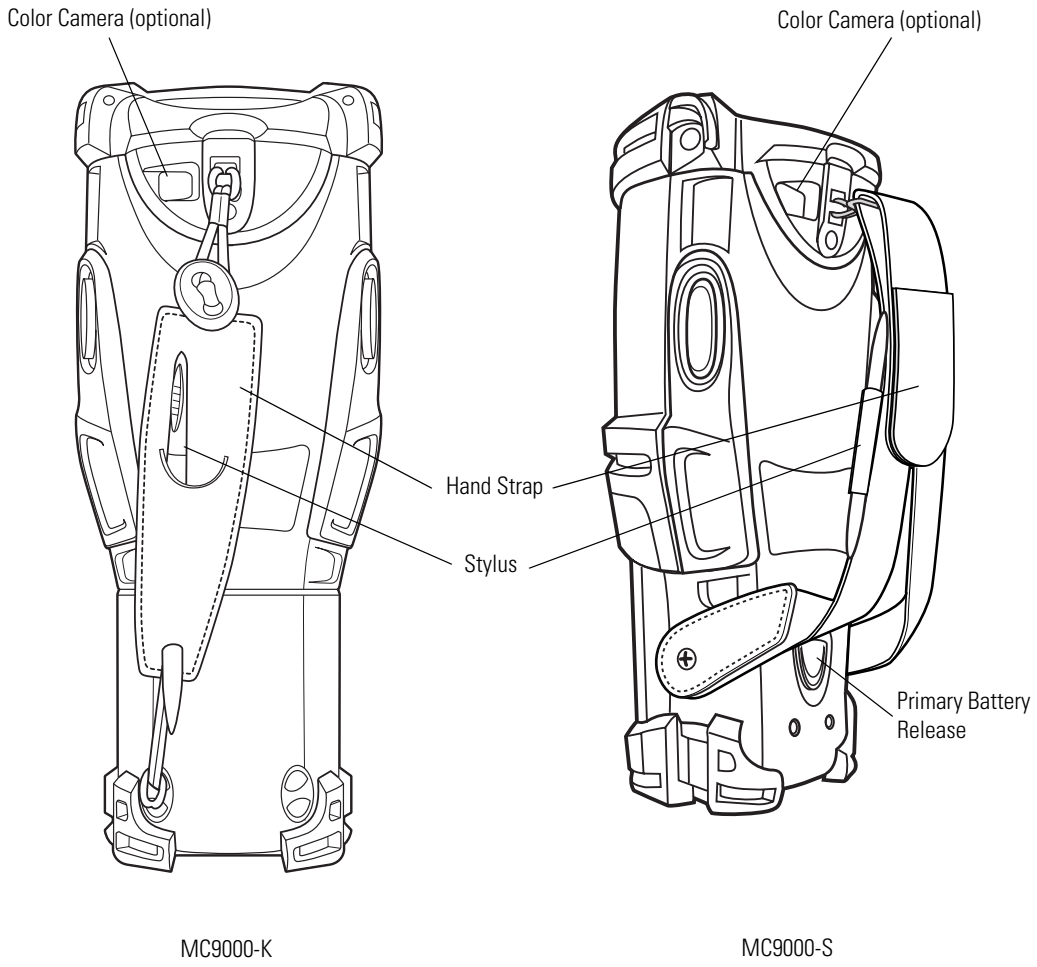


Figure 1-3. MC9000-K and MC9000-S: Back View

Unpacking

Carefully remove all protective material from around the mobile computer and save the shipping container for storage and/or re-shipping.

Verify that all of the equipment listed below was received:

- MC9000-K or MC9000-S mobile computer
- Lithium-ion battery
- Strap, attached to the mobile computer
- Stylus, in the hand strap pocket
- Regulatory Guide
- *Quick Start Guide* (poster).

Inspect the equipment for damage. If any equipment is missing or damaged, contact the Symbol Technologies Support Center immediately. See page xxiii for contact information.

Accessories

- Single Slot Serial/USB Cradle, charges the mobile computer main battery and a spare battery. It also synchronizes the mobile computer with a host computer through a serial or a USB connection.
- Four Slot Ethernet Cradle, charges the mobile computer main battery and synchronizes the mobile computer with a host computer through an Ethernet connection.
- Four Slot Charge Only Cradle, charges the mobile computer main battery.
- Four Slot Spare Battery Charger, charges up to four mobile computer spare batteries.
- Magnetic Stripe Reader (MSR), snaps on to the mobile computer and adds magstripe read capabilities.
- Cable Adapter Module (CAM), snap-on required to connect the following cables to the mobile computer:
  - AC line cord (country-specific) and power supply, charges the mobile computer.
  - Auto charge cable, charges the mobile computer using a vehicle's cigarette lighter.
  - DEX cable, connects the mobile computer to a vending machine.
  - Serial cable, adds serial communication capabilities.
  - USB cable, adds USB communication capabilities.
  - Printer cable, adds printer communication capabilities.
- Universal Battery Charger (UBC) Adapter, adapts the UBC for use with series 9000 batteries.
- Wall Mounting Bracket and Shelf Slide: Use for wall mounting applications.
- Optional Keypads: Application specific keypads.
- Multimedia Card (MMC): Provides secondary non-volatile storage.
- Wall Mounting Bracket and Shelf Slide, use for wall mounting applications.
- Spare lithium-ion batteries, MC9000-K (2200 mAh) and MC9000-S (1550 mAh).
- Short Battery Adapter: Required for charging MC9000-S (1550 mAh) batteries on the Four Slot Spare Battery Charger and the Single Slot Serial/USB Cradle.
- Stylus, performs pen functions.
- *Device Configuration Package for .NET (SMDK for .NET),* available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s
- Symbol Windows CE SMDK for Series 9000, available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s
- Holsters, to hold the mobile computer when not in use.
- Headphone, use in noisy environments.

Symbol Windows CE SDK and SMDK

Symbol offers two development kits for the MC9000-G:

- *Symbol Mobility Developer Kit for .NET (SMDK for .NET),* available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s
- Symbol Windows CE SDK for Series 9000, available at: http://www.symbol.com/mc9000-k and http://www.symbol.com/mc9000-s

The *Symbol Windows CE SDK for Series 9000* allows users to develop Windows® CE applications for Series 9000 mobile computers. This SDK contains libraries and other Symbol value-add software not available in the standard Microsoft® Windows® CE Platform SDK. For detailed information, see *Software Installation on page 8-1*. Symbol also offers other development kits, see: http://software.symbol.com.

Getting Started

The main battery can be charged before insertion into the mobile computer or after it is installed. Use one of the spare battery chargers to charge the main battery (out of the mobile computer) or one of the cradles to charge the main battery while it is installed in the mobile computer.

After installing and charging the battery, press the Power button to start the mobile computer.

Mobile computer startup procedures:

- *Insert the Main Battery on page 1-9*
- *Main Battery Removal on page 1-10*
- *Battery Charging on page 1-11*
- *Starting the Mobile Computer on page 1-17*.

Main Battery Insertion and Removal

Insert the main battery into the mobile computer before use. If the main battery is charged the mobile computer can be used immediately. If the main battery is not charged see *Battery Charging on page 1-11*.

Insert the Main Battery

To insert the main battery, slide the battery into the mobile computer, see Figure 1-4.

Note

Ensure the battery is fully inserted. Two audible clicks can be heard as the battery is fully inserted. A partially inserted battery may result in unintentional data loss.

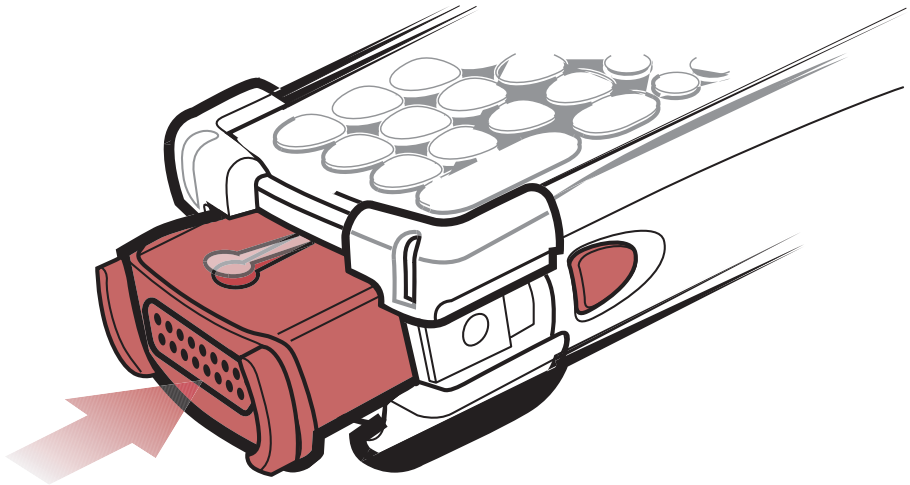


Figure 1-4. Insert Main Battery

Main Battery Removal

To remove the main battery:

1. Prior to removing the battery, press the red Power button to turn off the screen. This sets the mobile computer to suspend mode.
2. Simultaneously press both primary battery releases. The battery partially ejects from the mobile computer.
3. Pause 3-4 seconds while the mobile computer performs battery removal shutdown.
4. Press the secondary battery release, on top of the battery and slide the battery out of the mobile computer.

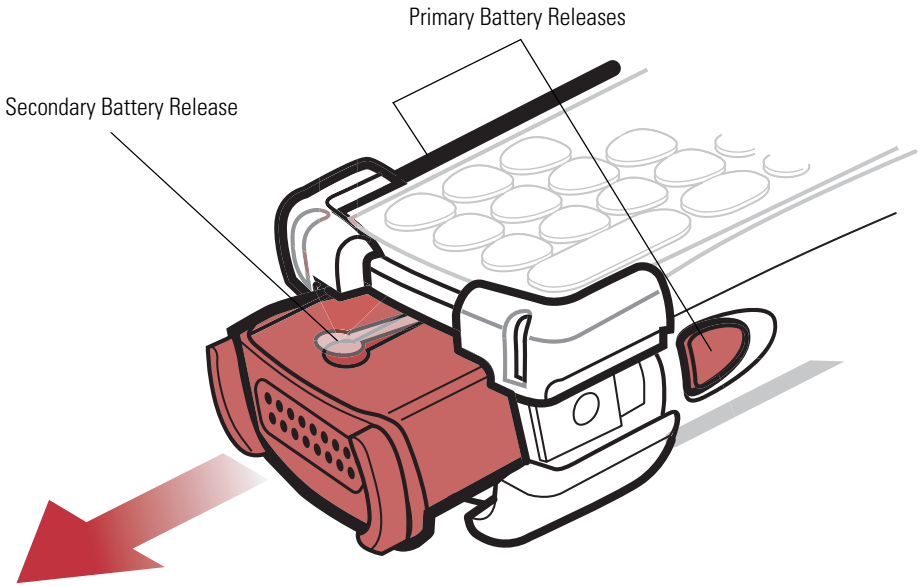


Figure 1-5. MC9000-K: Main Battery Removal

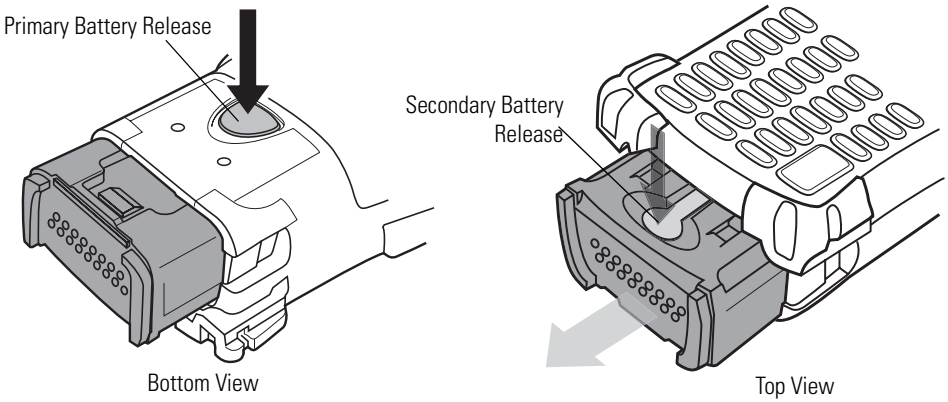


Figure 1-6. MC9000-S: Main Battery Removal

Battery Charging

Main Battery and Memory Backup Battery Charging

The mobile computer's cradles, snap-ons and spare battery chargers can be used to charge the mobile computer's main battery.

Before using the mobile computer for the first time, fully charge the main battery (until the charge indicator light remains lit) see *Table 1-1 on page 1-13*. Charge time is approximately four hours. The mobile computer can be charged using a cradle, a CAM or MSR (with a charging cable) or the main battery can be removed and charged using a spare battery charger.

The mobile computer is equipped with a memory backup battery which automatically charges from the fully-charged main battery. When the mobile computer is used for the first time, the backup battery requires approximately 15 hours to fully charge. This is also true any time the backup battery is discharged which occurs when the main battery is removed for several hours. The backup battery retains data in memory for at least 30 minutes after the mobile computer's main battery is removed. When the mobile computer reaches very low battery state, the combination of main battery and backup battery will retain data in memory for at least 72 hours.



Do not remove the main battery within the first 15 hours of use. If the main battery is removed before the backup battery is fully charged, data may be lost.

The following accessories can be used to charge batteries.

- Cradles: The mobile computer slips into the cradles for charging the battery in the mobile computer (and spare batteries, where applicable). For detailed cradle setup and charging procedures see:
  - Single Slot Serial/USB Cradle on page 7-10.
  - Four Slot Ethernet Cradle on page 7-28 and Four Slot Charge Only Cradles on page 7-30.
- Accessories: The mobile computer's snap-on accessories provide charging capability, when used with one of the accessory charging cables. For detailed snap-on setup and charging procedures see:
  - CAM on page 7-40
  - MSR on page 7-34.
- Chargers: The mobile computer's spare battery charging accessories are used to charge batteries that are removed from the mobile computer. For detailed spare battery charging accessories setup and charging procedures see:
  - Single Slot Serial/USB Cradle on page 7-10
  - Four Slot Spare Battery Charger onpage 7-32
  - Universal Battery Charger (UBC) on page 7-42.

Mobile Computer Charging Procedures

The mobile computer main and backup batteries can be charged using a cradle, the CAM or the MSR. The CAM and the MSR also require a charging cable and a Symbol approved power supply.

1. Connect the charging accessory to the appropriate power source, see *Chapter 7, Accessories* for setup information.
2. Insert the mobile computer into a cradle or attach the appropriate snap-on module.
3. The mobile computer starts to charge automatically. The amber charge LED, in the Indicator LED Bar, lights to show the charge status. See Table 1-1 for charging indications.

The main battery usually fully charges in less than four hours.

Table 1-1. Mobile Computer LED Charge Indicators

LED	Indication
Off	Mobile computer not in cradle/CAM/MSR; mobile computer not placed correctly; charger is not powered.
Fast Blinking Amber	Error in charging; check placement of the mobile computer.
Slow Blinking Amber	Mobile computer is charging.
Solid Amber	Charging complete. Note: When the battery is initially inserted in the mobile computer, the amber LED flashes once if the battery power is low or the battery is not fully inserted.

Spare Battery Charging

The mobile computer has three accessories that can be used to charge spare batteries.

- Single Slot Serial/USB Cradle
- Four Slot Spare Battery Charger
- UBC Adapter.

To charge a spare battery:

1. Connect the charging accessory to the appropriate power source, see *Chapter 7, Accessories* for setup.
2. Insert the spare battery into the spare battery charging slot and gently press down on the battery to ensure proper contact.
3. The battery starts to charge automatically. The amber charge LED on the accessory lights to show the charge status. See *Chapter 7, Accessories* for charging indications.

The battery usually fully charges in less than four hours.



A Short Battery Adapter is required to charge the MC9000-S spare battery in either the Single Slot Serial/USB Cradle or the Four Slot Spare Battery Charger, see *Single Slot Serial/USB Cradle on page 7-10* or *Four Slot Spare Battery Charger on page 7-32*.

Stylus

Use the mobile computer stylus for selecting items and entering information. The stylus functions as a mouse. Tap the touch screen once with the stylus to select options and open menu items. The stylus pocket is located in the strap, see *Figure 1-3 on page 1-5*.

Hand Strap

The hand strap may be moved to either the left or right side of the mobile computer to suit user preferences.

To reposition the MC9000-K hand strap:

1. Disengage the upper portion of the hand strap by disconnecting the button from the loop connector.
2. Loosen the loop from the bottom of the hand strap and slide the hand strap through.
3. Slide the loop out of the connector post.

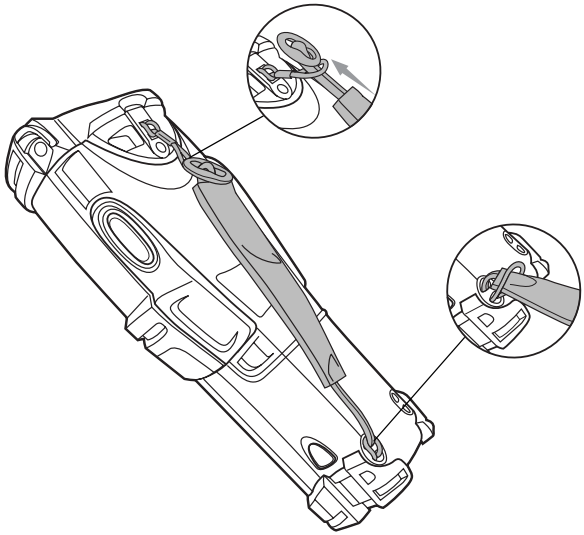


Figure 1-7. MC9000-K: Hand Strap Repositioning

4. Reverse the procedure to re-attach the hand strap. Two hand strap connectors are provided on the mobile computer's main body. The hand strap may be attached to either connector.

To remove the MC9000-S hand strap:

1. Disengage the upper portion of the hand strap by sliding it through the clip connector.
2. Unscrew the two screws on either side of the mobile computer.

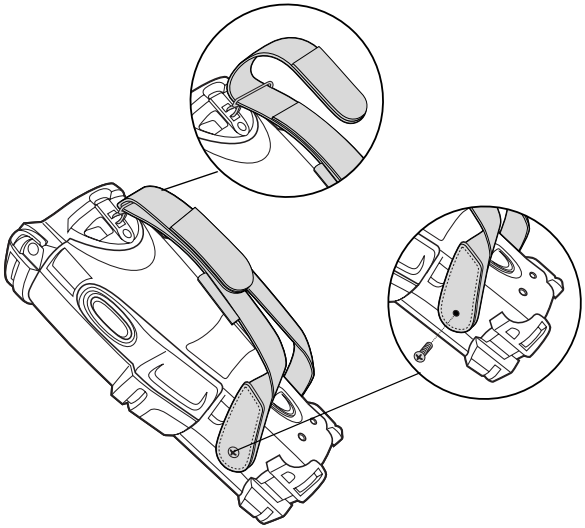


Figure 1-8. MC9000-S: Hand Strap Removal

3. Reverse the procedure to re-attach the hand strap.

Starting the Mobile Computer

Insert the battery, if the mobile computer does not power on perform a cold boot, see *Resetting the Mobile Computer on page 2-39*.

When the mobile computer is powered on for the first time, it initializes its flash file system. The Symbol splash screen appears for a short period of time, followed by the calibration screen. These screens also appear when a cold boot is performed.



Figure 1-9. Symbol Splash Screen

Calibration Screen

Use calibrate screen to align the touch screen:

1. Remove the stylus from the handle.
2. Carefully press and briefly hold the tip of stylus on the center of the calibration screen target. Repeat the procedure as the target moves and stops at different locations on the screen.
3. If the mobile computer already has screen calibration settings, the confirm calibration resave screen appears. Tap screen within 30 seconds to overwrite the existing calibration settings with the new settings or allow the timer to expire and the new calibration settings will not be saved.

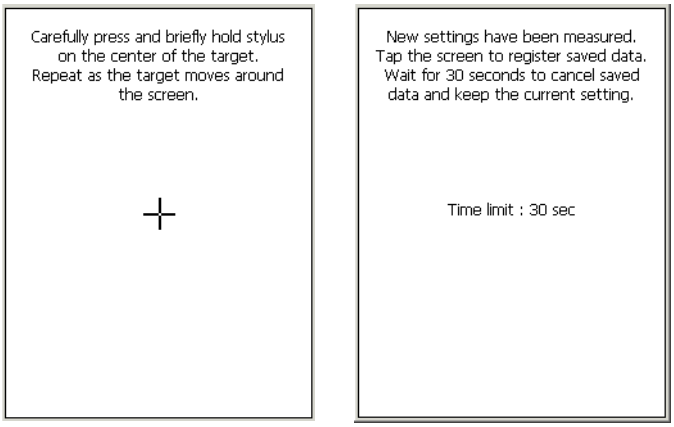


Figure 1-10. Calibration Screen

Mobile Computer Configuration

The following chapters provide the mobile computer configuration information:

- To customize the mobile computer settings, see *Chapter 3, Settings*.
- To set up ActiveSync to synchronize the mobile computer and accessories with the host computer, see *Chapter 4, Communications*.
- To configure the mobile computer for Spectrum24, see *Chapter 6, Spectrum24 Network Configuration*.
- To install development software on the development PC, see *Chapter 8, Software Installation*.
- To set up AirBEAM to synchronize the mobile computer with the host server, see *Chapter 9, AirBEAM Smart*.
- To configure the mobile computer using the Terminal Configuration Manager, see *Chapter 10, Mobile Computer Configuration*.

2

Operating the MC9000-K/S

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Introduction

This chapter provides basic instructions for using and navigating the mobile computer.

Keypads

The mobile computer has five interchangeable modular keypad configurations:

- 28-key keypad, see *page 2-4*
- 43-key keypad, see *page 2-8*
- 53-key keypad, see *page 2-11*.

The modular keypads can be changed in the field, as necessary, to support specialized applications. See *Keypads on page 7-7* for installation and removal procedures.



For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

For information about using the soft keyboard input panel, see *Entering Information Using the Keyboard Input Panel on page 2-34*.

28-Key Keypad

The 28-key keypad is used on both the MC9000-K, see Figure 2-1 and the MC9000-S, see Figure 2-2. It contains a Power button, application keys, scroll keys and a function key. The keypad is color-coded to indicate the alternate function key (blue) values and the alternate ALPHA key (orange) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-1 on page 2-6* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

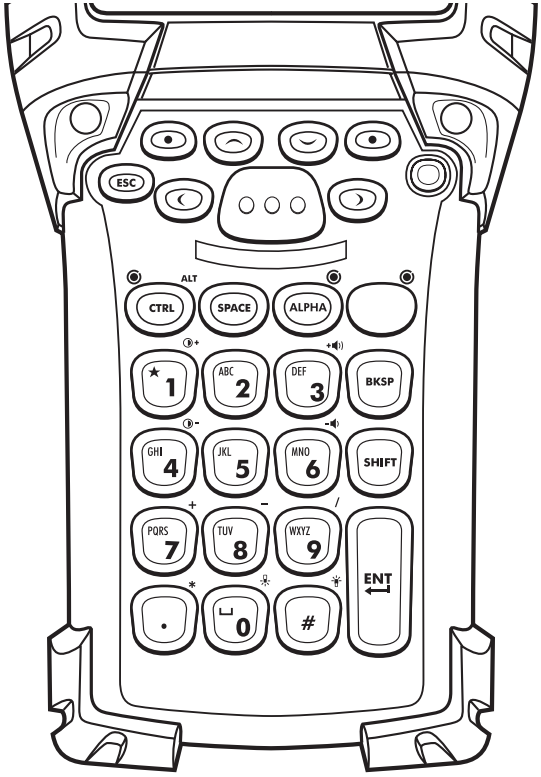


Figure 2-1. MC9000-K: 28-Key Keypad

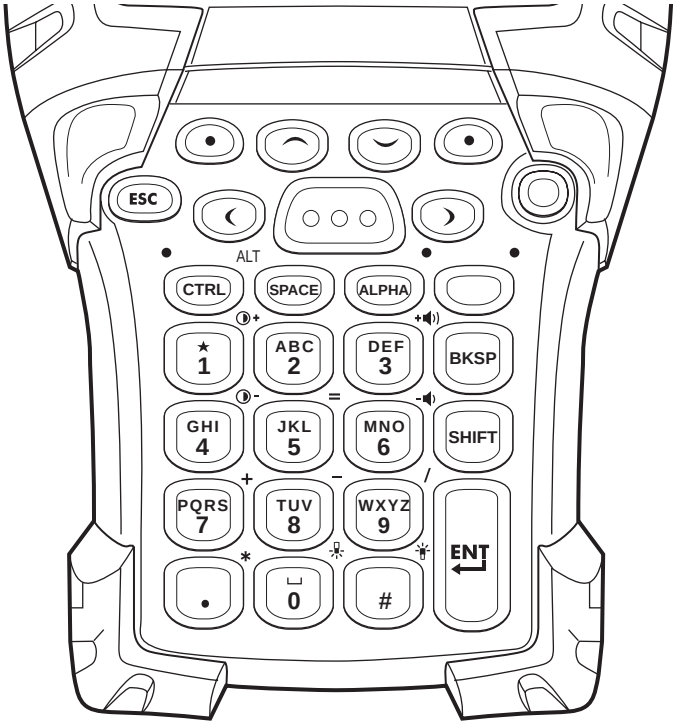


Figure 2-2. MC9000-S: 28-Key Keypad

Table 2-1. MC9000-K and MC9000-S: 28-Key Keypad Descriptions

Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the right scan button.
Scroll Up and Down 	Moves up and down from one item to another. Increases/decreases specified values.
Scroll Left and Right 	Moves left and right from one item to another. Increases/decreases specified values.
ESC 	Exits the current operation.
SPACE 	Performs the space functions.
BKSP 	Performs the backspace functions.
One/Star 	Produces the number one in default state. Produces an asterisk in Alpha state.
Alphanumeric 	In default state, produces the numeric value on the key. In Alpha state, produces the lower case alphabetic characters on the key. Each key press produces the next alphabetic character in sequence. For example, press and release the **ALPHA** key and then press the **4** key once to produce the letter ‘g’; press and release the **ALPHA** key and then press the **4** key three times to produce the letter ‘i’. When the **SHIFT** key is pressed in Alpha state, the upper case alphabetic characters on the key are produced. For example, press and release the **ALPHA** key, press and hold the **SHIFT** key and then press the **4** key once to produce the letter ‘G’; press and release the **ALPHA** key, press and hold the **SHIFT** key and then press the **4** key three times to produce the letter ‘I’.

Table 2-1. MC9000-K and MC9000-S: 28-Key Keypad Descriptions (Continued)

Key	Description
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the F icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the ^ icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.
ALPHA (orange) 	The default keypad mode is the num-lock (number lock) mode. The num-lock icon N appears on the taskbar to indicate num-lock mode is active. Press the orange ALPHA key to de-activate the num-lock mode and to access the alternate ALPHA characters (shown on the keypad in orange).
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries and a decimal point for numeric entries.
Zero 	In default state, produces a zero. In Alpha state, produces a space.
Pound 	Produces a pound/number sign.
Enter 	Executes a selected item or function.

Note

For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

43-Key Keypad

The 43-key keypad is available only on the MC9000-K, see Figure 2-3. It contains a Power button, application keys, scroll keys and a function key. The keypad is color-coded to indicate the alternate function key (blue) values and the alternate ALPHA key (orange) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-2 on page 2-9* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

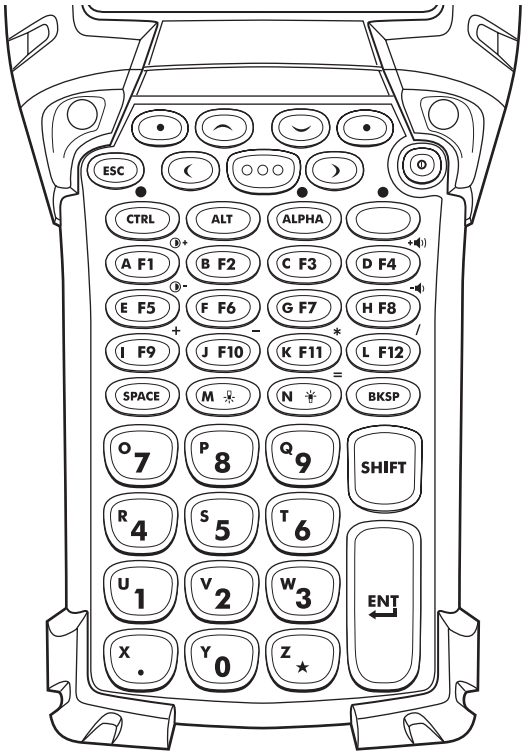
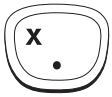


Figure 2-3. MC9000-K: 43-Key Keypad

Table 2-2. MC9000-K: 43-Key Descriptions

Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the right scan button.
Scroll Up and Down 	Moves up and down from one item to another. Increases/decreases specified values.
Scroll Left and Right 	Moves left and right from one item to another. Increases/decreases specified values.
ESC 	Exits the current operation.
SPACE/BKSP 	Space and backspace functions.
Numeric/Special Function/ Alpha 	Numeric or special function (or) by default or alpha value when the **ALPHA** key is selected.
Alpha/Application 	These keys can have an application assigned to the function value and have an alpha value assigned when used with the ALPHA function key.
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the F icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.

Table 2-2. MC9000-K: 43-Key Descriptions (Continued)

Key	Description
ALT 	Press and release the ALT key to activate the keypad ALT (alternate) functions. The ALT icon appears on the taskbar. Press and release the ALT key again to return to the normal keypad functions.
ALPHA (orange) 	The default keypad mode is the num-lock (number lock) mode. The num-lock icon N appears on the taskbar to indicate num-lock mode is active. Press the orange ALPHA key to de-activate the num-lock mode and to access the alternate ALPHA characters (shown on the keypad in orange).
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries, a decimal point for numeric entries and the alphabetic character X when the ALPHA function key is activated.
Star 	Produces an asterisk and the alphabetic character Z when the ALPHA function key is activated.
Enter 	Executes a selected item or function.

Note

For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

53-Key Keypad

There are two physical configurations of the 53-key keypad, however both of the keypads are functionally identical. The 53-key keypad is available only on the MC9000-K. It contains a Power button, application keys, scroll keys and function keys. The keypad is color-coded to indicate the alternate function key (blue) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-3 on page 2-12* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

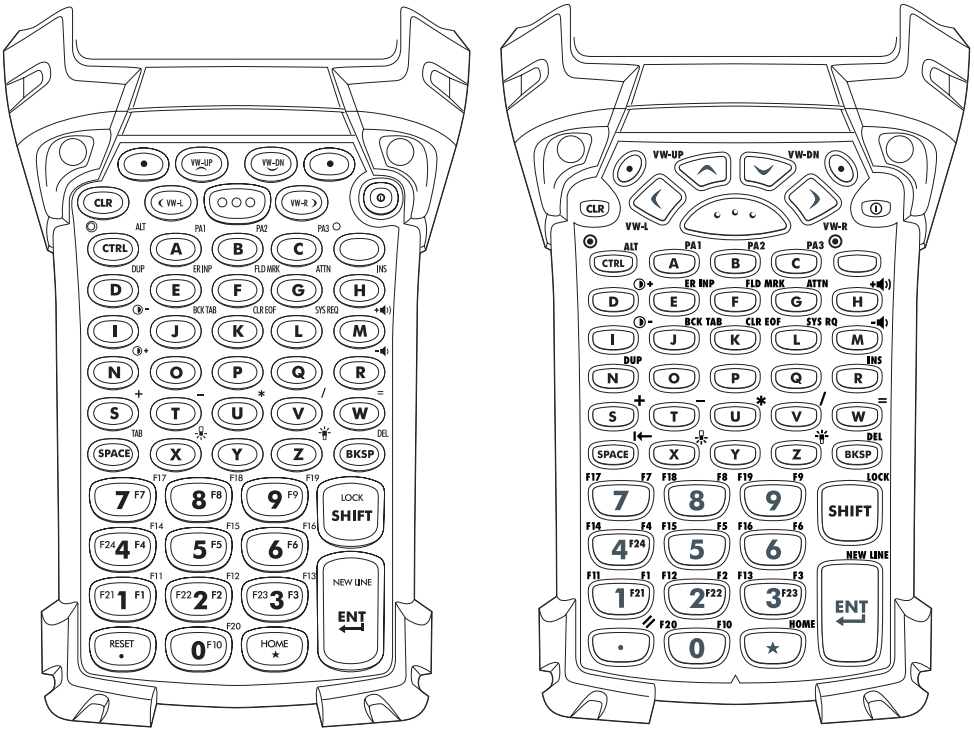
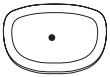
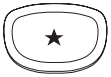


Figure 2-4. MC9000-K: 53-Key Keypad

Table 2-3. MC9000-K: 53-Key Descriptions

Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the right scan button.
Scroll Up and Down 	Moves up and down from one item to another. Increases/decreases specified values.
Scroll Left and Right 	Moves left and right from one item to another. Increases/decreases specified values.
ESC 	Exits the current operation.
Alpha 	Use the alpha keys for alphabetic characters.
SPACE/BKSP 	Space and backspace functions.
Numeric/Application 	Numeric value keys - can have applications assigned with function key(s).
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the F icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the ^ icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.

Table 2-3. MC9000-K: 53-Key Descriptions (Continued)

Key	Description
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries and a decimal point for numeric entries.
Star 	Produces an asterisk.
Enter 	Executes a selected item or function.

Note

For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

3270 Emulator

The 3270 emulator keypad is available only on the MC9000-K. It contains a Power button, application keys, scroll keys and a function key. The keypad is color-coded to indicate the alternate function key (blue) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-4 on page 2-15* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

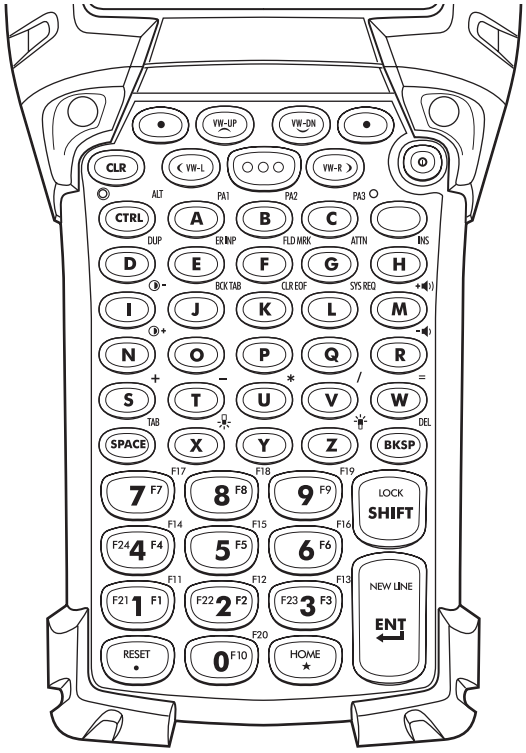


Figure 2-5. 3270 Emulator Keypad

Note

The 3270 emulator keypad is only used when the mobile computer is running the 3270 emulation software. When the mobile computer is not running the 3270 emulation software, the 3270 keypad functions are the same as a 53-key keypad.

Table 2-4. 3270 Emulator Descriptions

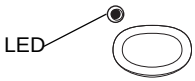
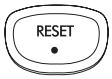
Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the scan button.
Scroll Up and Down 	Moves up and down from one item to another. Increases/decreases specified values.
Scroll Left and Right 	Moves left and right from one item to another. Increases/decreases specified values.
CLR 	Exits the current operation.
Alpha 	Use the alpha keys for alphabetic characters.
SPACE/BKSP 	Space and backspace functions.
Application 	These keys can be assigned to an application.
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the **F** icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the ^ icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.

Table 2-4. 3270 Emulator Descriptions (Continued)

Key	Description
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries and a decimal point for numeric entries.
Star 	Produces an asterisk.
Enter 	Executes a selected item or function.

Note

For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

5250 Emulator

The 5250 emulator keypad is available only on the MC9000-K. It contains a Power button, application keys, scroll keys and a function key. The keypad is color-coded to indicate the alternate function key (blue) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-5 on page 2-18* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

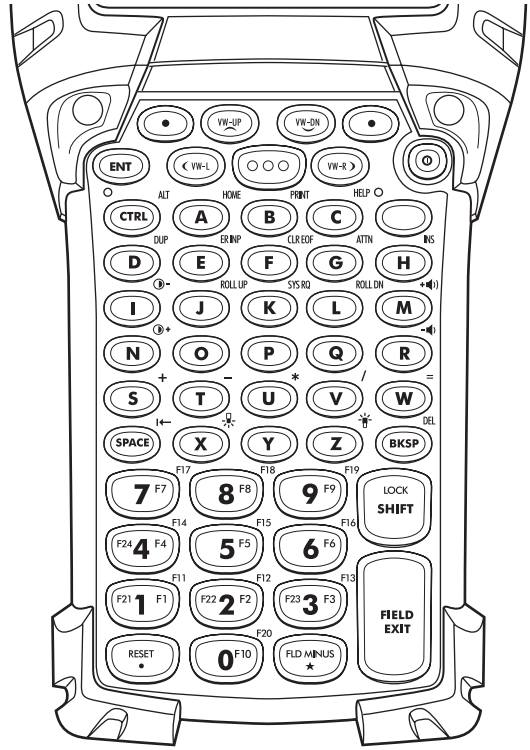


Figure 2-6. 5250 Emulator Keypad

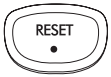
Note

The 5250 emulator keypad is only used when the mobile computer is running the 5250 emulation software. When the mobile computer is not running the 5250 emulation software, the 5250 keypad functions are the same as a 53-key keypad.

Table 2-5. 5250 Emulator Descriptions

Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the scan button.
Scroll Up and Down 	Moves up and down from one item to another.
Scroll Left and Right 	Moves left and right from one item to another.
ENT 	Exits the current operation.
Alpha 	Use the alpha keys for alphabetic characters.
SPACE/BKSP 	Space and backspace functions.
Application 	These keys can be assigned to an application.
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the F icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the ^ icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.

Table 2-5. 5250 Emulator Descriptions (Continued)

Key	Description
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries and a decimal point for numeric entries.
Star 	Produces an asterisk.
Enter 	Executes a selected item or function.



For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

VT Emulator

The VT emulator keypad is available only on the MC9000-K. It contains a Power button, application keys, scroll keys and a function key. The keypad is color-coded to indicate the alternate function key (blue) values. Note that keypad functions can be changed by an application so the mobile computer's keypad may not function exactly as described. See *Table 2-6 on page 2-21* for key and button descriptions and *Table 2-7 on page 2-23* for the keypad's special functions.

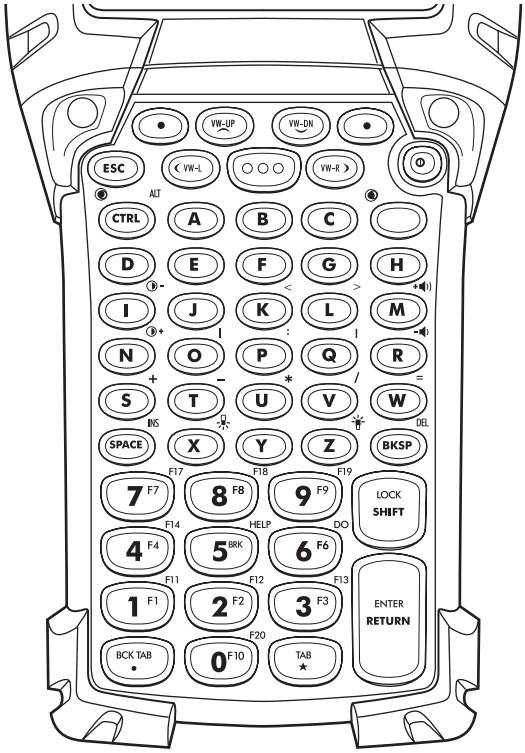


Figure 2-7. VT Emulator Keypad

Note

The VT emulator keypad is only used when the mobile computer is running the VT emulation software. When the mobile computer is not running the VT emulation software, the VT keypad functions are the same as a 53-key keypad.

Table 2-6. VT Emulator Descriptions

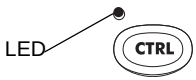
Key	Description
Power (red) 	Powers the mobile computer on and off. Used to reset the mobile computer, see *Resetting the Mobile Computer on page 2-39*.
Green/Red Dot 	Unassigned application function key. See *Appendix B, Keypad Maps* for mapping details.
Scan (yellow) 	Scan key - used for scanning applications, this key has the same function as pushing the scan button.
Scroll Up and Down 	Moves up and down from one item to another.
Scroll Left and Right 	Moves left and right from one item to another.
ESC 	Exits the current operation.
Alpha 	Use the alpha keys for alphabetic characters.
SPACE/BKSP 	Space and backspace functions.
Application 	These keys can be assigned to an application.
Function (blue) 	Press and release the blue function key to activate the keypad alternate functions (shown on the keypad in blue). The keypad LED lights and the F icon appears on the taskbar, see *Table 2-9 on page 2-27*. Press and release the blue function key again to return to the normal keypad functions.
Control 	Press and release the CTRL key to activate the keypad alternate CTRL functions. The keypad LED lights and the ^ icon appears on the taskbar. Press and release the CTRL key again to return to the normal keypad functions.

Table 2-6. VT Emulator Descriptions (Continued)

Key	Description
Shift 	Press and release the SHIFT key to activate the keypad alternate SHIFT functions. The ↑ icon appears on the taskbar. Press and release the SHIFT key again to return to the normal keypad functions.
Period/Decimal Point 	Produces a period for alpha entries and decimal point for numeric entries.
Star 	Produces an asterisk.
Enter 	Executes a selected item or function.

Note

For detailed keypad configurations including ASCII values and VK codes, see *Appendix B, Keypad Maps*.

Keypad Special Functions

The keypad special functions are color coded on the keypads. For example, on the 53-key keypad, the display backlight icon is blue indicating that the blue function key must be selected first to access the display backlight. On the 43-key keypad, the display backlight icon is white indicating that the display backlight is the default value for that key.

Table 2-7. Keypad Special Functions

Icon	28-Key, Keystrokes	43-Key Keystrokes	53-Key, 3270, 5250, VT Keystrokes	Special Function
	Blue function key and **#**	 key	Blue function key and **Z**	Turns on and off the display backlight.
	Blue function key and **0**	 key	Blue function key and **X**	Turns on and off the keypad backlight.
	Blue function key and **1**	Blue function key and **F1**	Blue function key and **D**	Increases display contrast (on monochromatic units only).
	Blue function key and **4**	Blue function key and **F5**	Blue function key and **I**	Decreases display contrast (on monochromatic units only).
	Blue function key and **3**	Blue function key and **F4**	Blue function key and **H**	Increases beeper volume.
	Blue function key and **6**	Blue function key and **F8**	Blue function key and **M**	Decreases beeper volume.
ALT *	Blue function key and **CTRL**	Not Available	Blue function key and **CTRL**	Enables Alt keypad functions.



Use of display and keypad backlighting can significantly reduce battery life.

Mobile computers with color screens do not have contrast settings.

Power Button

Press the red Power button to turn the mobile computer screen on and off. The mobile computer is on when the display is on and the mobile computer is in suspend mode when the display is off. For more information, see *Starting the Mobile Computer on page 1-17*.



Do not hold down any key, button or the scan button, other than the Power button during a reset.

Cold boot resets the mobile computer, to the default settings. All added applications and all stored data will be removed. Do not cold boot without support desk approval.



Any data previously synchronized with a computer can be restored during the next ActiveSync operation. See *Chapter 4, Communications* for detailed ActiveSync instructions.

The Power button is also used to reset the mobile computer by performing a warm or cold boot.

- Warm Boot (Soft Reset) - Resets the mobile computer.
- Cold Boot (Hard Reset) - Resets the mobile computer, removes all added applications, stored data restores the default settings.

For information about rebooting the mobile computer, refer to *Resetting the Mobile Computer on page 2-39*.

Headphone

An optional headphone is available. The headset plugs into the optional headphone jack located at the top of the mobile computer, see *Figure 1-2 on page 1-4*. Set the mobile computer volume appropriately before putting on the headset. When a headset is plugged into the jack, the speaker is muted.

Series 9000 Demo Window

On initial power up (or on a warm or cold boot) the *Series 9000 Demo* window appears. The *Series 9000 Demo* window icon functions are provided in Table 2-8.

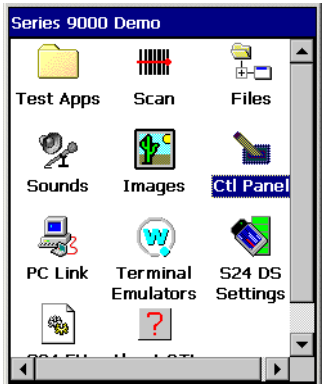


Figure 2-8. Series 9000 Demo Window

Table 2-8. Series 9000 Demo Window Functions

Icon	Description
Test Apps	Displays the *Test Applications* window, see *Introduction on page 5-3* for a description of the *Test Applications* window.
Scan	Use to set up and run the demonstration scan application, see *ScanSamp2 on page 5-6*.
Files	Displays the system file structure, see *InkWiz File Browser on page 5-9*.
Sounds	Displays the *AudioSamp* sample application, see *AudioSamp on page 5-13*.
Images	Displays the image viewer sample application, see *Images on page 5-14*.

Table 2-8. Series 9000 Demo Window Functions (Continued)

Icon	Description
 Ctl Panel	Displays the control panel menu, see *Control Panel on page 3-40*.
 PC Link	Starts the *PC Link* application, see *PC Link on page 5-16*.
 Terminal Emulators	Provides access to the terminal emulators, see *Terminal Emulators on page 2-44*.
 S24 DS Settings	Provides access to the S24 DS Settings, see *Mobile Companion on page 6-4*.
 S24 FH Settings	Provides access to the S24 FH Settings, see *Spectrum24 Frequency Hopping (FH) Settings (1 and 2 MB Radios) on page 6-30*.
 About OTL	Provides information about the OTL application, see *About OTL on page 5-17*.



The *Series 9000 Demo* window is the factory default launcher menu. Application specific shells may vary.

Taskbar

The taskbar (at the bottom of the window) displays the *Start* button, active programs (in this case *PC Link* and *Mobile Companion*), battery status and the communication status. The default taskbar icons are described in Table 2-9 and the default taskbar buttons are described in *Table 2-10 on page 2-28*. The *Start* button functions are described in *Sart Button on page 2-29*.

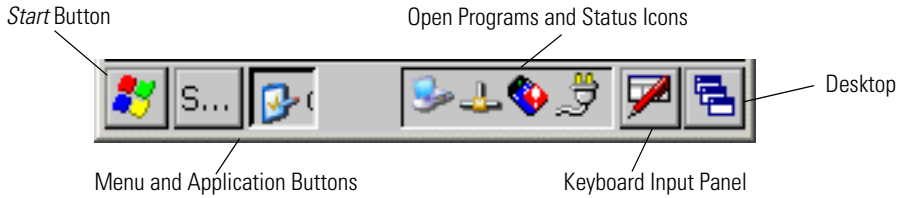


Figure 2-9. Taskbar

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Table 2-9. Taskbar Icons

Icon	Description
	Indicates that the battery is charging.
	Indicates that the battery charge is fully charged (100% charge). The battery status icons provide the battery status in 10% increments from 10% to 100%.
	Indicates that the battery is fully charged and the mobile computer is running on external power.
	Indicates IP status. Only displays when the mobile computer is in emulation mode.
	Indicates that the ActiveSync application is running.
	Indicates that the *Shift* character selection is selected.
F	Indicates that the *Function* character selection is selected.
	Indicates that the *Control* character selection is selected.
ALT	Indicates that the *ALT* character selection is selected.
N	Indicates that the *Num-lock* character selection is selected.
	The Mobile Companion utility. Tap to display the LAN status selection menu.
A	Indicated that the mobile computer is in *Alpha* mode. The mobile computer automatically enters Alpha mode when the Terminal Emulators are run.

Table 2-10. Taskbar Buttons

Icon	Description
	The *Start* button. Tap to display the Start menu.
	The Keyboard Input Panel, display button. Tap to display the Keyboard Input Panel.
	The Keyboard Input Panel hide button. Tap to hide the Keyboard Input Panel.
	The Desktop display button. Tap to display the Desktop.

Sart Button

Tap the *Start* button to launch the *Start Menu* or tap the *Start* button while in the ALT state and the Task Manager, Properties menu appears, see *Task Manager and Properties on page 2-31*.

- *Programs*: Use to access available programs
- *Favorites*: Displays files in *Favorites*
- *Documents*: Displays files in *Documents*
- *Settings*: Accesses the Control Panel, the Network and Dial-up Connections and the Taskbar and Start Menus.
- *Run*: Runs a program or application
- *Suspend*: Suspends the mobile computer.

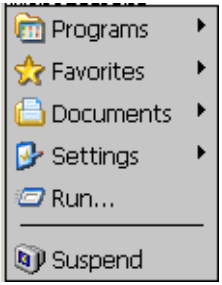


Figure 2-10. Start Menu

Keyboard Input Panel Button

Use the Keyboard Input Panel as an alternate input device, see *Entering Information Using the Keyboard Input Panel on page 2-34*.

Desktop Button

Use the *Desktop* button to minimize all open programs and display the *Desktop*.

Major desktop functions include:

- My Computer: Double-tap icon to open My Computer
- Recycle Bin: Deleted files remain in the recycle bin until the recycle bin is emptied. Once emptied the files cannot be retreived.
- Remote Desktop Connection: Use the *Remote Desktop Connection* icon to access the *Remote Desktop Connection* window.

Taskbar Icons

The taskbar icons display the function status, indicate what programs are active and indicate the battery charge status. The taskbar icons are provided in *Table 2-9 on page 2-27*.

Status Icons

The status icons indicate the function key status. Icond indicate if the Function, Shift, **CTRL** or **ALT** functions are active.

Active Programs Icons

If more than one program is active, the applications' icons can be used to toggle between the open programs (applications). Tap on a taskbar application to maximize the application.

AC Power/Battery Status Icons

The AC Power/Battery Status icons are shown in the taskbar to indicate the present power supply status of the mobile computer. The battery status icons provide the battery status in 10% increments from 10% to 100%, see *Table 2-9 on page 2-27* . Battery status can also be viewed on the battery status window, see *Battery on page 3-46*.



The amber LED in the mobile computer indicator LED bar, see *Figure 1-1 on page 1-3*, also indicates low battery status and/or incorrect battery insertion.

Task Manager and Properties

Use the Task Manager to stop applications and use the Properties functions to set display and clock options.

Task Manager

1. Select *Function* - **CTRL**, *(*to activate the ALT state) and tap the *Start* button to display the *Task Manager, Properties Selection* menu.
2. Tap Task Manager to display the Task Manager window.



Figure 2-11. Task Manager, Properties Selection Menu

3. Tap a task in the Active Tasks list and tap **Switch To** to make that task the primary task, or tap **End Task** to end the selected task.
4. Tap **X** to exit the Task Manager window.

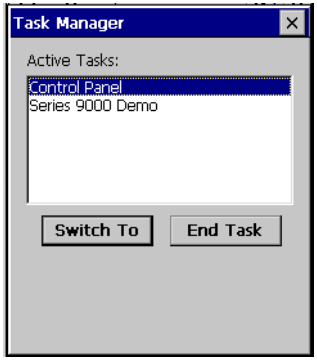


Figure 2-12. Task Manager Window

Properties

1. Select *Function* - ***CTRL***, *(*to activate the ALT state) and tap the *Start* button to display the Task Manager, Properties window, see *Figure 2-11 on page 2-31*.
2. Tap Properties to display the Taskbar and Start Menu, General Tab.
3. This menu provides taskbar options:
   - Check the *Always on Top* checkbox to keep the taskbar on top of all other windows.
   - Check the *AutoHide* checkbox to make the taskbar disappear, touch the bottom of the display to make the taskbar return.
   - Check the *Show Clock* checkbox to display the clock on the taskbar.
4. Tap **OK** to save the settings and exit the window.



Figure 2-13. Taskbar and Start Menu, General Tab

Advanced Tab

1. Tap the *Advanced* tab to enter the Taskbar and Start Menu, Advanced Tab.
2. Tap the **Clear** button to delete all of the documents listed in the *Start - Documents* entry, see *Sart Button on page 2-29*. Typically this list is empty, but if there were documents in the list the **Clear** button would delete them.
3. Tap the *Expand Control Panel* checkbox to display the entire contents of the MS control panel in list form, rather than Icons..

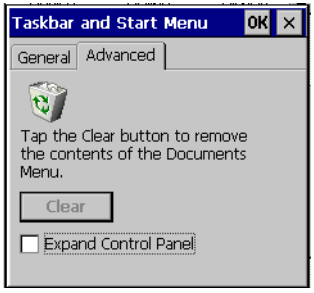


Figure 2-14. Taskbar and Start Menu, Advanced Tab

4. Tap **OK** to save the settings and exit the window.

Entering Information

To enter information:

- Use the keypad.
- Use the input panel (soft keyboard) to enter typed text.
- Scan bar code data into data fields.
- Use Microsoft® ActiveSync® to synchronize or copy information from the host computer to the mobile computer. For more information on ActiveSync, see *Chapter 4, Communications* or ActiveSync Help on the host computer.

Entering Information Using Keypad

The alphanumeric keypads produce the 26-character alphabet (A-Z), numbers (0-9), function keys and assorted characters. The keypads' default characters/functions are printed white and the *function* character/functions are printed blue. See *Keypads on page 2-3* for keypad configurations and see *Table 2-7 on page 2-23* for keypad special functions.

Entering Information Using the Keyboard Input Panel

Use the keyboard input panel to enter information in any program. To launch the keyboard input panel, tap *Start*, tap the *Soft KeyBd* menu selection and then tap the icon. Tap on a key to enter the key's value. Tap on the keyboard selection icon to display or to hide the keyboard input panel.

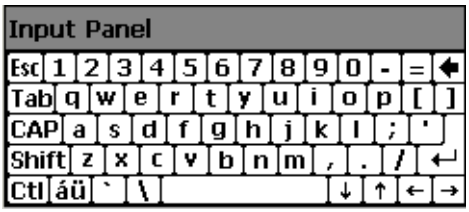


Figure 2-15. Keyboard Input Panel

Entering Data via the Bar Code Scanner (Scan Wedge)

The integrated bar code scanner uses the Scan Wedge program to scan data into data fields in the same way data is entered via the keypad. The Scan Wedge program is provided as a sample application in the SMDK, see *Chapter 8, Software Installation* for the SMDK installation.

Data Capture

The mobile computer has an integrated scanner used to collect data by scanning bar codes.

Laser Scanning

To scan bar codes with the mobile computer:

1. Ensure that the mobile computer is loaded with a scanning application. See *ScanSamp2 on page 5-6* for a sample scanning application.
2. Aim the scan exit window at the bar code.
3. Push the scan button. Ensure the red scan beam covers the entire bar code. The indicator LED bar illuminates red to indicate that the laser is on. The indicator LED bar illuminates green and a beep sounds to indicate a successful decode.

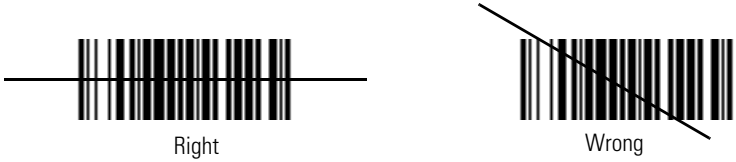


Figure 2-16. Laser Aiming

Optimal scanning distance varies with bar code density and scanner optics.

- Hold the scanner farther away for larger symbols.
- Move the scanner closer for symbols with bars that are close together.

Note

Scanning procedures depend on the application and mobile computer configuration. An application may use different scanning procedures from the one listed above.

Indicator LED Bar

The Indicator LED bar provides a visual indication of the scan status, see *Figure 1-1 on page 1-3*.

Table 2-11. Scan LED Indicators

LED Status	Indication
Off	Not scanning.
Solid Red	Laser enabled, scanning in process.
Solid Green	Successful decode.

Scanning Considerations

Typically, scanning is a simple matter of aim, scan/decode and a few quick trial efforts master it. However, two important considerations can be used to optimize any scanning performance:

- Range

  Any scanning device decodes well over a particular working range — minimum and maximum distances from the bar code. This range varies according to bar code density and scanning device optics.

  Scanning within range brings quick and constant decodes; scanning too close or too far away prevents decodes. Move the scanner closer and further away to find the right working range for the bar codes being scanned. However, the situation is complicated by the availability of various integrated scanning modules. The best way to specify the appropriate working range per bar code density is through a chart called a decode zone for each scan module. A decode zone simply plots working range as a function of minimum element widths of bar code symbols.

- Angle

  Scanning angle is important for promoting quick decodes. When laser beams reflect directly back into the scanner from the bar code, this specular reflection can "blind" the scanner.

  To avoid this, scan the bar code so that the beam does not bounce directly back. But don't scan at too sharp an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice quickly shows what tolerances to work within.



Contact the Symbol Support Center if chronic scanning difficulties develop. Decoding of properly printed bar codes should be quick and effortless.

Imaging

The imager version of the mobile computer has the following features:

- Omnidirectional reading of a variety of bar code symbologies, including the most popular linear, postal, PDF417 and 2-D matrix code types.
- The ability to capture and download images to a host for a variety of imaging applications.
- Advanced intuitive laser aiming for easy point-and-shoot operation.

Imager

The imager uses digital camera technology to take a digital picture of a bar code, stores the resulting image in its memory and executes state-of-the-art software decoding algorithms to extract the data from the image. A typical bar code decoding process is as follows:

1. Aim the imager version of the mobile computer at a bar code and push the scan button.
2. The red laser aiming pattern turns on to assist in aiming the mobile computer.
3. If necessary, the mobile computer turns on its red LEDs to illuminate the target bar code.
4. The mobile computer takes a digital picture (image) of the bar code and stores it in memory for decoding.
5. An audible beep occurs indicating the bar code was decoded properly.
6. Release the scan button.

This process usually occurs instantaneously. Steps 2 - 4 are repeated on poor or difficult bar codes as long as the scan button remains pulled.

Operational Modes

The imager version of the mobile computer has two modes of operation: Decode Mode and Image Capture Mode, activated by pushing the scan button.

Decode Mode

In this default mode, upon pushing the scan button, the Imager attempts to locate and decode enabled bar codes within its field of view. The Imager remains in this mode as long as the scan button is pressed, or until a bar code is decoded.

Aiming the Imager

The imager version of the mobile computer projects a laser aiming pattern (shown below) similar to those used on cameras. The aiming pattern is used to position the bar code or object within the field of view.

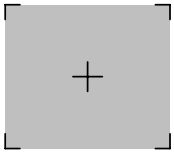


Figure 2-17. Laser Aiming Pattern

Imager symbol scanning:

1. Center the symbol in any orientation within the aiming pattern. Ensure the entire symbol is within the rectangular area formed by the brackets in the aiming pattern.

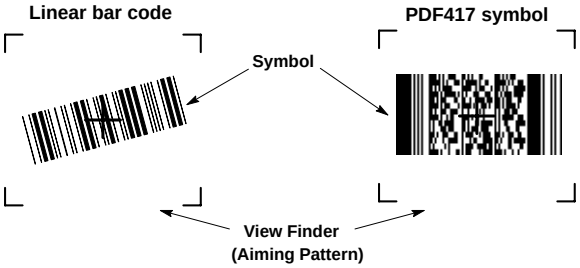


Figure 2-18. Centering Symbol in Aiming Pattern

The imager can also read a bar code presented within the aiming pattern but not centered, such as the figure below on the left. The figure on the right, however, can not be decoded.



Figure 2-19. Imager Aiming

2. The aiming pattern is smaller when the Imager is closer to the symbol and larger when it is farther from the symbol. Scan symbols with smaller bars or elements (mil size) closer to the unit and those with larger bars or elements (mil size) farther from the unit.
3. Hold the mobile computer between two and nine inches (depending on symbol density) from the symbol, centering the aiming pattern cross hairs on the symbol.
4. Press and hold the scan button until the mobile computer beeps, indicating the bar code is successfully decoded.

Resetting the Mobile Computer

If the mobile computer stops responding to input, reset it. There are two reset functions, warm boot and cold boot. A warm boot restarts the mobile computer by closing all running programs. All data that is not saved to flash memory is lost.

A cold boot also restarts the mobile computer, but erases all stored records and entries. In addition it returns formats, preferences and other settings to the factory default settings.

Perform a warm boot first. This restarts the mobile computer and saves all stored records and entries. If the mobile computer still does not respond, perform a cold boot.

Performing a Warm Boot

Hold down the Power button for approximately five seconds. As soon as the mobile computer starts to perform a warm boot release the Power button.

Or the the warm boot command can be excuted from the *Programs* menu, tap *Start - Programs - Warm Boot.*



Files that remain open during a warm boot may not be retained.

Performing a Cold Boot

A cold boot restarts the mobile computer and erases all user stored records and entries. *Never perform a cold boot unless a warm boot does not solve the problem.*



Do not hold down any key, button or the scan button, other than the Power button during a reset.

Cold boot resets the mobile computer, to the default settings. All added applications and all stored data will be removed. Do not cold boot without support desk approval.



Any data previously synchronized with a computer can be restored during the next ActiveSync operation. See *Chapter 4, Communications* for detailed ActiveSync instructions.

To perform a cold boot:

1. Press the mobile computer's primary battery releases to partially eject the battery. The secondary battery release tab is now visable, see *Figure 1-5 on page 1-10*.
2. While the battery is partially ejected, press and hold the Power button, while pushing the battery back into the fully inserted position.
3. Continue holding the Power button for 15 seconds. After the first five seconds the unit may start to perform a warm boot. The message Warm Boot appears in the upper left hand corner of the screen. Continue holding the Power button and the unit cycles into a cold boot. The message Booting System appears in the top center of the screen.
4. As the mobile computer initializes its Flash File system, the Symbol splash window, *Figure 1-6 on page 1-11* appears for about a minute.
5. Calibrate the screen. See *Calibration Screen on page 1-18* to calibrate the mobile computer display.

Waking the Mobile Computer

The wakeup conditions are configurable and the current factory default settings are subject to change/update.

The mobile computer wakeup configuration is set in the registry file, registry file editing procedures are provided in the SMDK, refer to *Chapter 8, Software Installation* for the SMDK installation. Table 2-12 lists the wakeup conditions settings.

Table 2-12. Wakeup Conditions

Status	Description	Action	Conditions for wakeup
Power Off	When the mobile computer goes into sleep mode by pressing **Power**, these actions wake the mobile computer.	Power	1. Power button is pressed. 2. AC power added or removed.
		Scan Button	Scan button is pressed.
		WLAN	Wireless LAN accesses the mobile computer.
		Clock	Real Time Clock set to wake up.
Auto Off	When the mobile computer goes into sleep mode by an automatic power-off function, these actions wake the mobile computer.	Power	1. Power button is pressed. 2. AC power added or removed.
		Scan Button	Scan button is pressed.
		WLAN	Wireless LAN accesses the mobile computer.
		Clock	Real Time Clock set to sleep.

File System Directory Structure

The mobile computer directory structure displays all of the file folders, see Figure 2-20. The pre-installed folders are in flash file system memory and optional removable storage devices (MMC storage cards).

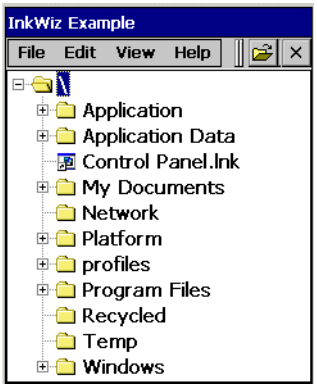


Figure 2-20. Mobile Computer Directory Structure

- *Application* and *Platform* folders are located in flash file system memory.
- The *Windows*, *Program Files*, *profiles*, and *My Documents* folders are composites, RAM based folders generated from ROM (many of these files are marked read only).
- The *Network* folder is a link to file systems mapped using the network redirector. The files do not physically reside on the terminal.
- The *Temp* and *Recycled* folders typically contain RAM based files.

Note

All files copied to the RAM based folders are lost after a cold boot.

Flash Storage

In addition to the RAM-based storage the mobile computer is also equipped with a non-volatile Flash-based storage area which can store data (partitions) that can not be corrupted by a cold boot, see *Flash Storage on page 10-27* for a detailed discussion.

Startup Folder

The *Applications/Startup* folder is used to launch programs automatically when the mobile computer is started, either after a warm or cold boot.



The Windows/Startup folder is not supported.

There are two ways to launch programs automatically:

1. Place the executable in the Startup folder of the Application partition.
2. Place a .run file in the Startup folder of the Application partition.

Refer to the *Windows CE Help File for Symbol Terminals* included with the SMDK for more information on the Startup folder.

Run Files

A .run file is a simple text file that contains the path to an application as well as the name of the application to run.

Refer to the *Windows CE Help File for Symbol Terminals* included with the SMDK for more information on the Startup folder.

Audio Event Aliasing

Audio Event Aliasing is the means by which standard Windows .wav files are rendered on a non-audio terminal using only a beeper.

The audio driver of the mobile computer supports a feature called Event Aliasing. This feature allows a special .wav file to play. This .wav file replaces the sound normally produced when running a .wav file with other actions (such as LED flashing, etc.).

This feature allows applications that play .wav files to be portable between two devices, one that supports real audio and one that supports audio aliasing.

Terminal Emulators

Use the *Terminal Emulator*s icon to enter the Wavelink terminal emulator application.

From the *Series 9000 Demo* window, double-tap the *Terminal Emulators* icon. The *Terminal Emulator* window appears.

To exit, tap *TelnetCE Options* and tap *ExitExit*.

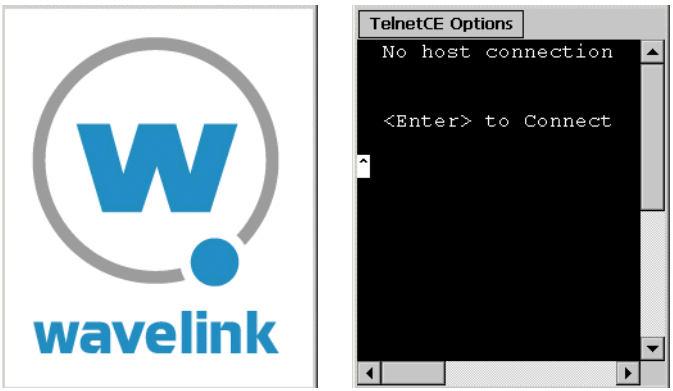


Figure 2-21. Terminal Emulator Window

Refer to the documentation provided with the terminal emulator software package for setup and use.

3

Settings

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Introduction

This chapter provides basic instructions for customizing the mobile computer by adjusting settings. The system settings are accessed from the *Windows CE Control Panel menu* (see *Table 3-1 on page 3-6*) , the *Series 9000 Demo* menu (see *Table 3-4 on page 3-39*) and the *Control Panel* menu (see *Table 3-5 on page 3-40*).

Windows Control Panel Menu

To view available options for the mobile computer settings, tap *Start - Settings - Control Panel*.

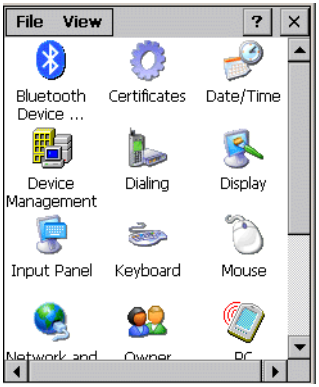


Figure 3-1. Windows Control Panel Menu

Table 3-1 lists the applications available in the *Windows Control Panel Menu*.

Table 3-1. Windows Control Panel Menu Icons

Icon	Description
 Bluetooth Device ...	Scan for, and setup Bluetooth compatible hardware, see *Bluetooth Device Properties on page 3-8* for more information.
 Certificates	View and modify digital certificates which are used by some applications for establishing trust for secure communications, see *Certificates on page 3-15* for more information.
 Date/Time	Change date, time and time zone information, see *Date/Time on page 3-16* for more information.
 Device Management	Configure device management, install and view available software, see *Device Management on page 3-17* for more information.
 Dialing	Set dialing properties for modem communication and change telephony settings, see *Dialing on page 3-18* for more information.
 Display	Change desktop background, appearance, backlight, and brightness, see *Display on page 3-20* for more information.
 Input Panel	Switch input methods and set input options, see *Input Panel on page 3-22* for more information.
 Keyboard	Change keyboard repeat delay and rate, see *Keyboard on page 3-23* for more information.

Table 3-1. Windows Control Panel Menu Icons (Continued)

Icon	Description
 Mouse	Adjust double-click sensitivity for both the speed and timing.
 Network and Dial-up	Connect to other computers, networks, and the Internet through a modem, see *Certificates on page 3-15* for more information.
 Owner	Change owner's personal profiles, see *Owner on page 3-26* for more information.
 PC Connection	Change settings for connectivity of a host computer, see *PC Connection on page 3-28* for more information.
 Regional Settings	Change how numbers, currencies, dates, and times are displayed, see *Regional Settings on page 3-29* for more information.
 Remove Programs	Remove loaded programs from RAM, see *Remove Programs on page 3-32* for more information.
 Stylus	Calibrate the touch screen and adjust double-tap timing, see *Stylus on page 3-33* for more information.
 System	View system information, and change memory settings, see *System on page 3-35* for more information.

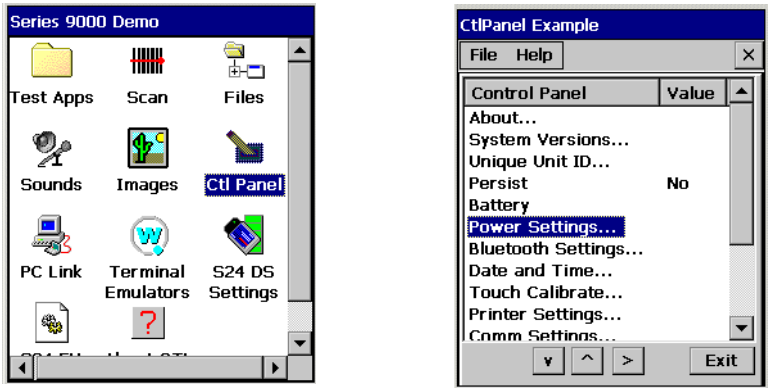
Bluetooth Device Properties

Use the *Bluetooth Manager* window to discover and create bonds with other Bluetooth devices. The mobile computer can receive information from discovered devices, without creating a bond. However, the exchange of information between the mobile computer and a bonded device occurs automatically when the Bluetooth radio is turned on. Creating a bond involves entering the same PIN on the two devices to bond. Once a bond is created, and the Bluetooth radios are turned on, the devices recognize the bond and are able to exchange information without re-entering a PIN.

Bluetooth/S24 Power Settings

Both the S24, 802.11b and Bluetooth operate in the same 2.4 GHz unlicensed frequency band. Sharing the same frequency band could result in performance degradation. To minimize interference use the power settings to turn off the S24 radio while the Bluetooth radio is being used.

1. To turn off the S24 radio and turn on the Bluetooth radio double tap *Control Panel - Power Settings*:



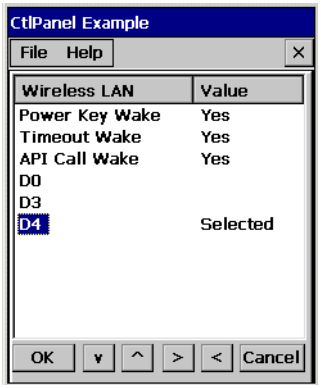
Control Panel Icon Power Settings

Figure 3-2. Control Panel Power Settings

2. Scroll down the *Power Settings* window and double tap *wlp1: Wireless LAN*.
3. Double tap *D4* in the *S24 Power Selection* window. This setting turns off the S24 radio.



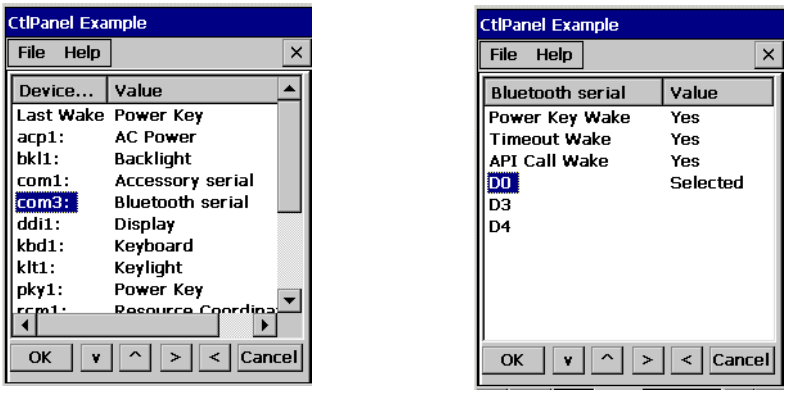
S24 Power Settings



S24 Power Selection

Figure 3-3. S24 Power Settings

4. Scroll up the *Power Settings* window and double tap *com3: Bluetooth serial*.
5. Double tap *D0* in the Bluetooth Power Selection window. This turns on the Bluetooth radio.



Power Settings Bluetooth Power Selection

Figure 3-4. Bluetooth Power Settings

Starting Bluetooth

1. Select *Start - Settings - Control Panel,* and double-tap the *Bluetooth Device Properties* icon.

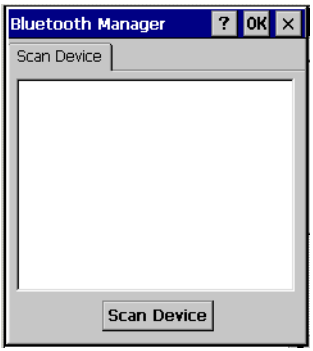


Figure 3-5. Bluetooth Manager Window

2. Tap the **Scan Device** button to initiate a scan for Bluetooth hardware. The Bluetooth manager lists the Bluetooth devices that it finds, see Figure 3-6. If Bluetooth hardware is not found the *Bluetooth Error* window appears, see Figure 3-7. Table 3-2 described the Bluetooth Icons.

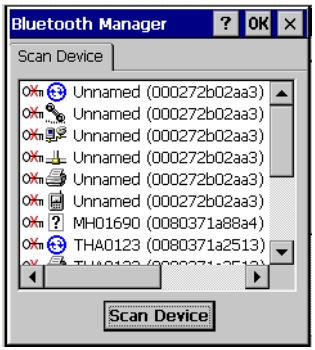


Figure 3-6. Bluetooth Manager Device List Window



Figure 3-7. Bluetooth Error Window

Note

If the device to which the mobile computer is bonding does not appear in the list, ensure it is turned on, in discoverable mode, and within range (30 feet/ 10 meters) of the mobile computer.

Table 3-2. Bluetooth Icons

Icon		Description
	Unknown device icon	Device is not defined
	Locked icon	Device is locked and cannot be bonded to.
	Not locked icon	Device is not locked and can be bonded to.
	Bluetooth device icon	Bluetooth device
	Bonded device icon	Bonded Bluetooth device
	Mobile device icon	Device is a mobile device
	Phone icon	Device is a phone.
	Printer icon	Device is a printer
	Network icon	Device is a network.
	Linked icon	Device is linked.

3. Double tap the device to connect to on the device list. The Bluetooth Manager Authentication window appears. Tap **No** to connect to the device without authentication, or tap **Yes** to authenticate the device before connecting.



Figure 3-8. Bluetooth Manager Authentication Window

4. If the **Yes** button was selected in the Bluetooth Manager Authentication window, the enter PIN windows appears. Enter a PIN (between 1 and 16 characters) in the *Enter PIN:* text box, and tap **OK**. The mobile computer sends the PIN request to the device for bonding.

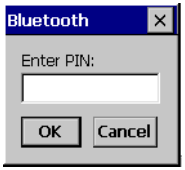


Figure 3-9. Bluetooth Enter PIN Window

5. When prompted, the same PIN must be entered on the other device. When the PIN is entered correctly on the other device, the bonded icon appears on the device list.

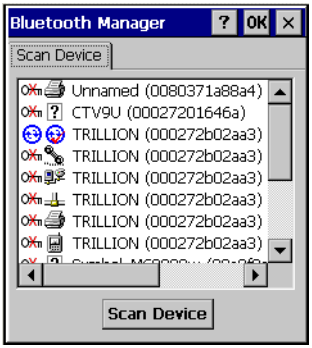


Figure 3-10. Bluetooth Bonded Devices Window

Certificates

Certificates are used by some applications for establishing trust and for secure communications. Certificates are signed and issued by certificate authorities and are valid for a prescribed period of time. Windows CE manages multiple certificate stores.

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *Certificates* icon.

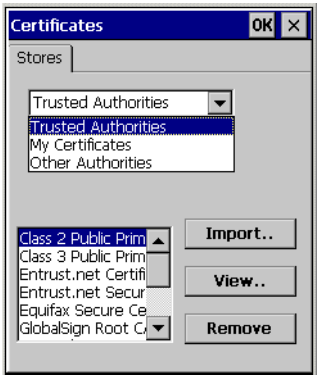


Figure 3-11. Certificates Window

2. Select the certificate group (from the drop-down list) to be viewed or modified.
   - The *Trusted Authorities* store lists the top-level certificates for trusted authorities.
   - The *My Certificates* store contains the personal certificates, which are used for identification.
   - *The Other Authorities* store lists intermediate certificate authorities that help establish a chain of trust.
3. To add a certificate or associated private key to the selected store, tap *Import*.
4. To view more details of the selected certificate, such as the expanded name or expiration date, tap *View*.
5. To delete a certificate, select it in the drop-down list and tap *Remove*.
6. Tap **OK** for the settings to take effect.

Date/Time

Use the *Date/Time Properties* window to change the date, time and time zone information.

1. Select *Start - Settings - Control Panel,* and double-tap the *Date/Time* icon.

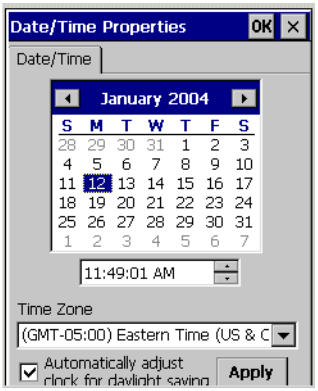


Figure 3-12. Date/Time Properties Window

2. Use the arrows to select the month in the *Date/Time* tab.
3. Tap the date, to select it.
4. Tap to highlight the hours, minutes or seconds entry. Tap the up or down arrows to increment the highlighted value.
5. Select the appropriate time zone from the *Time Zone* drop down list.
6. Tap **Apply** or **OK** to save the new settings.

Device Management

Use Device Management to keep track of software and hardware, inventory, and configure devices remotely.

The device management client contains a download/install engine that allows users to receive software and notifications when there are new applications or Operating System (OS) updates. The device management system also allows the downloading and running of scripts to enable configuration and customized management. The Windows CE Device Management Client works with the Microsoft Systems Management Server (SMS), to provide the required capabilities.

1. Select *Start* - *Settings* - *Control Panel,* and double-tap the *Device Management* icon.



Figure 3-13. Device Management Window

2. Enter the host system server name or IP address (the System Administrator can supply this information) in the *Server name or IP address* field.
3. Tap the *Use Secure connection* selection box to require that a secure connection is used
4. Tap **OK** to close the window and set up the next poll to contact the new server.

Dialing

Use the *Dialing Properties* window to set dialing properties for modem communication and change telephony settings.

1. Select *Start - Settings - Control Panel,* and double-tap the *Dialing* icon.



Figure 3-14. Dialing Properties Window

2. To remove a location from the *Location:* drop-down list, select the location and tap **Remove**.
3. Enter or edit the area code and local country code as needed.
4. Select *Tone dialing* or *Pulse dialing* (most phone lines are tone.)
5. Select the *Disable call waiting* check box to automatically disable call waiting. Then select the appropriate number sequence from the *dial* drop-down list, or enter a new sequence.
6. To create a new location, tap **New** and enter a name for the new location in the *Location name* field.

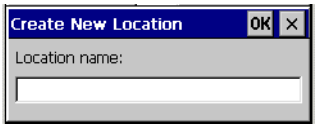


Figure 3-15. Create New Location Window

7. To edit the dialing properties select the location from the *Location:* drop-down list, and tap Edit. The *Edit Dialing Patterns* window appears.
8. Use the codes listed in Table 3-3, edit the dialing patterns in the *Edit Dialing Patterns* window. Tap **OK** to save the new entries or tap **X** to exit without saving the new entries.

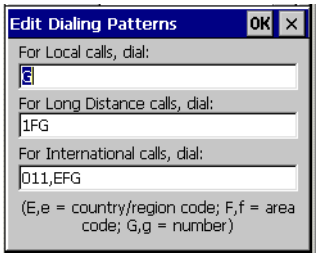


Figure 3-16. Edit Dialing Patterns Window

Note

To use characters other than the ones listed in Table 3-3, use manual dialing. Hyphens and spaces in dialing strings are ignored.
Some modems may not respond to the characters listed, even though the mobile computer lets them to be added to the dial string.

Table 3-3. Dialing Characters

To	Enter
Dial country code (specified by the dialing program)	E
Dial area code (specified by the dialing program)	F
Dial local number (specified by the dialing program)	G
Insert a pause (typically 2 seconds)	, (comma)
Wait for credit card tone (specified by the dialing program)	$(dollar sign)
Wait for second tone (typically used after $)	W
Tone-dial the following numbers	T
Pulse-dial the following numbers	P
Transfer to another extension (0.5 sec on hook, 0.5 sec off hook)	! (hookflash)
Wait for “quiet answer” (typically indicated by 6.5 seconds of silence followed by a ringing tone)	@
Use special controls on some systems (tone only)	ABCD or * or #

Display

Use the *Display Properties* window to change desktop background image and the display appearance.

Background Tab

To select the background image:

1. Select *Start - Settings - Control Panel,* and double-tap the *Display* icon, tap the *Background* tab.



Figure 3-17. Display Properties - Background Tab

2. From the *Image:* drop-down list, select the desktop background image. To locate an image in another folder, tap **Browse**.
3. To have the image cover the entire background, select *Tile image on background*.
4. Tap **OK** to save settings.

Appearance Tab

To change the color scheme:

1. Select *Start - Settings - Control Panel,* and double-tap the *Display* icon, tap the *Appearance* tab.

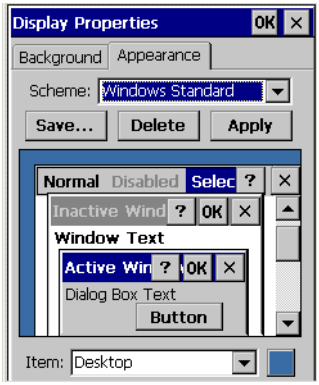


Figure 3-18. Display Properties - Appearance Tab

2. From the *Scheme:* drop-down list, select a scheme.
3. Select the color scheme item from the *Item:* drop-down list.
4. View the choice in the preview box, tap **Apply** to apply the scheme

To create a custom scheme:

1. Select *Start - Settings - Control Panel,* and double-tap the *Display* icon, tap the *Appearance* tab.
2. From the *Item:* drop-down list, select a display item.
3. Tap the square next to the *Item:* drop-down list.
4. From the *Basic colors:* list, select a color, and tap **OK**.
5. View the color selection(s) in the preview box.
6. Tap **Save** to save the scheme.
7. In the *Save scheme As* box, enter a name for the scheme, and tap **OK**.
8. Tap **Apply**.

Input Panel

Use the *Input Panel Properties* window to switch input methods and to set the input options.

1. Select *Start - Settings - Control Panel*, and double-tap the *Input Panel* icon.

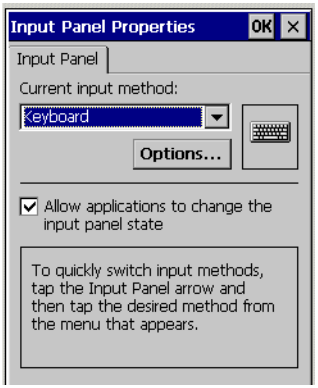


Figure 3-19. Input Panel Properties

2. From the *Current input method:* drop-down list, select the input method.
3. Tap **Options** to open the *Soft Keyboard Options* window.

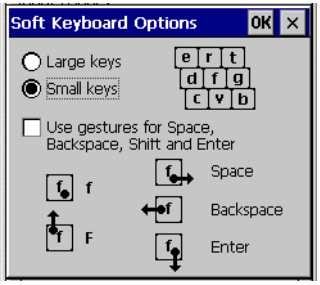


Figure 3-20. Soft Keyboard Options Window

4. Make the settings changes.
5. Tap **OK** to save the changes and exit the *Soft Keyboard Options* window.
6. Tap **OK** to apply the changes.

Keyboard

Use the *Keyboard Properties* window to change the keyboard repeat rate and repeat delay.

1. Select *Start* - *Settings* - *Control Panel,* and double-tap the *Keyboard* icon.

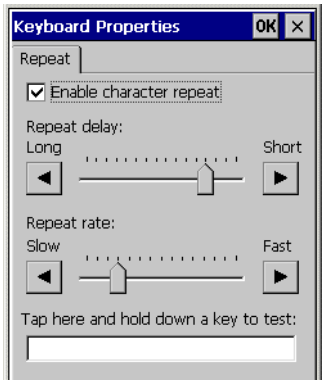


Figure 3-21. Keyboard Properties - Repeat Tab

2. Tap the *Enable character repeat* check box.
3. Drag the *Repeat delay:* slider, to change the repeat delay time.
4. Drag the *Repeat rate:* slider, to change the repeat rate.
5. Test the new settings in the text box provided.
6. Tap **OK** to apply the changes.

Mouse

Use the *Mouse Properties* window to adjust stylus double-tap timing.

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *Mouse* icon.



Figure 3-22. Mouse Properties Window

2. Double-tap the checkerboard grid at a comfortable speed.
3. Double-tap the clapboard to test the settings.
4. Tap **OK** to apply changes.

Network and Dial-up Connections

Use the *Connection* window to set connections to other computers, networks, and the Internet.

1. Select *Start - Settings - Control Panel,* and double-tap the *Network and Dial-up Connections* icon.



Figure 3-23. Connection Window

2. Double an icon to select a connection type.
3. Follow the connection type instructions.
4. Tap **OK** to apply changes.

Owner

Use the *Owner Properties* window to enter the owner information. The information can be displayed when the mobile computer is turned on. To enter information:

Identification Tab

1. Select *Start - Settings - Control Panel*, and double-tap the *Owner* icon.
2. Select the *Identification* tab.

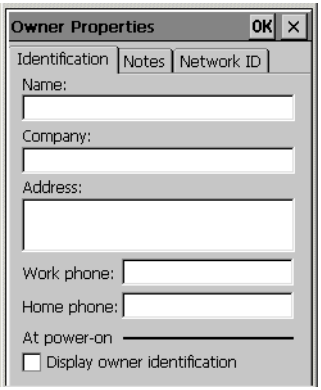


Figure 3-24. Owner Properties Window - Identification Tab

3. Fill in or edit the owner information.
4. Select the *Display Owner Identification* check box to display this information when the mobile computer starts.

Notes Tab

1. Select the *Notes* tab and enter information in the *Notes* box to add more information.
2. Select the *Display owner notes* box to include this information on the startup display.

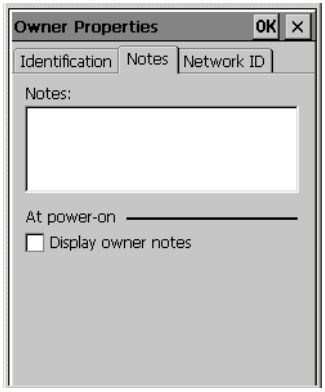


Figure 3-25. Owner Properties Window - Notes Tab

Network ID Tab

To setup identification for remote networks, select the *Network ID* tab and enter the user name, password, and domain name used to log on to the remote network.

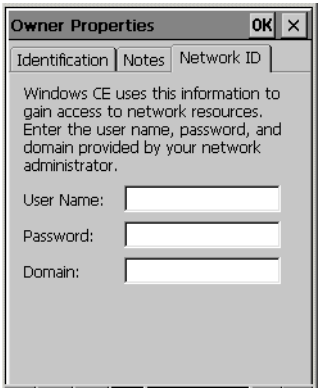


Figure 3-26. Owner Properties Window - Network ID Tab

PC Connection

Use the *PC Connection Properties* window to set the mobile computer communication baud rate (with the host computer).

1. Select *Start - Settings - Control Panel*, and double-tap the *PC Connection* icon.

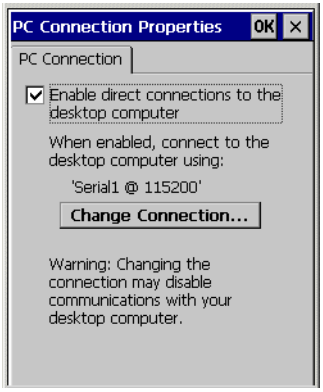


Figure 3-27. PC Connection Properties Window

2. Select the *Enable direct connections to the desktop computer* checkbox to allow for direct connections.
3. Tap **Change Connection** to change the selection.

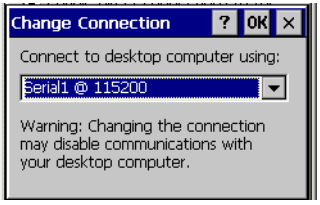


Figure 3-28. Change Connection Window

4. Select the connection type from the drop-down list.
5. Tap **OK** to select the connection type and exit the *Change Connection* window.
6. In the *PC Connection Properties* window, tap **OK** to apply the changes.

Regional Settings

Use the Regional Settings, to set the way the mobile computer displays dates, times, currency amounts, large numbers, and numbers with decimal fractions. The system of measurement can also be set to either metric or U.S.

Region Tab

The selectable input locales are listed in the *Your local:* drop-down list. Corresponding *User Interface Language:* choices are provided (where appropriate for a particular location selection). Some location selections also provide special features, such as font characters or spell checkers designed for different languages.

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *Regional Settings* icon.

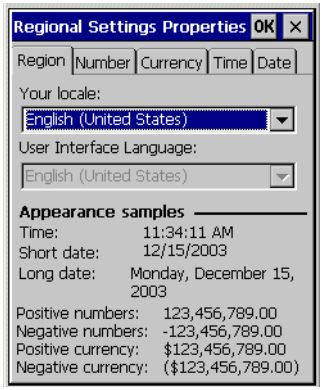


Figure 3-29. Regional Settings Properties - Region Tab

2. From the *Your locale:* drop-down list, select the appropriate location.
3. If applicable, select the appropriate language from the *User Interface Language* drop-down list.

Number Tab

1. Select the *Number tab.*

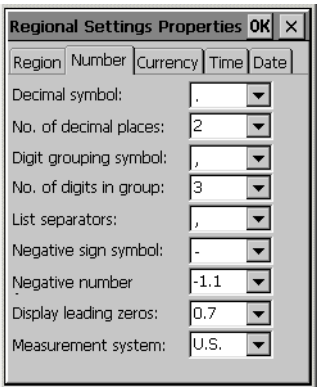


Figure 3-30. Regional Settings Properties - Number Tab

2. Select desired options. The available options are determined by the *Your local:* selection and by the *User Interface Language* selection (on the *Region* tab).

Currency Tab

1. Select the *Currency tab.*

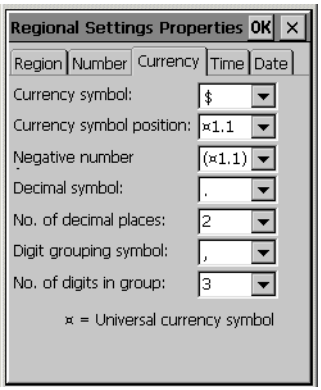


Figure 3-31. Regional Settings Properties - Currency Tab

2. Select desired options. The available options are determined by the *Your local:* selection and by the *User Interface Language* selection (on the *Region* tab).

Time Tab

1. Select the *Time tab.*

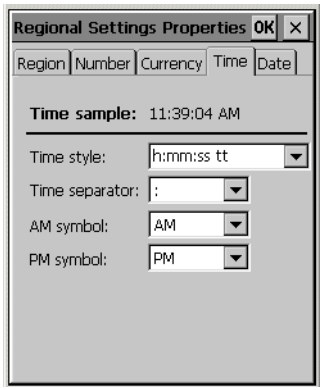


Figure 3-32. Regional Settings Properties - Time Tab

2. Select desired options. The available options are determined by the *Your local:* selection and by the *User Interface Language* selection (on the *Region* tab).

Date Tab

1. Select the *Date tab.*

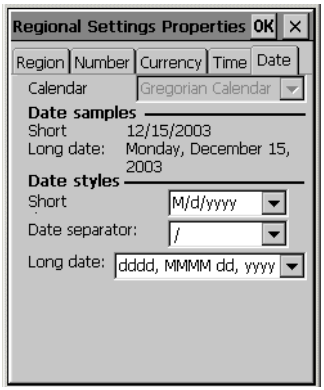


Figure 3-33. Regional Settings Properties Window - Date Tab

2. Select desired options. The available options are determined by the *Your local:* selection and by the *User Interface Language* selection (on the *Region* tab).

Remove Programs

Use the *Remove Programs* window to remove user installed programs from the mobile computer:

1. Select *Start - Settings - Control Panel,* and double-tap the *Remove Programs* icon.
2. Select the program to be removed from the programs list.



Figure 3-34. Remove Programs Window

3. Tap **Remove**.
4. Tap **OK** or **X** to exit the *Remove Programs* window.

Stylus

Use the *Stylus Properties* window *Double-Tap* to adjust double-tap timing and use the *Calibrate* tab to recalibrate the touch screen.

Double-Tap Tab

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *Stylus* icon.

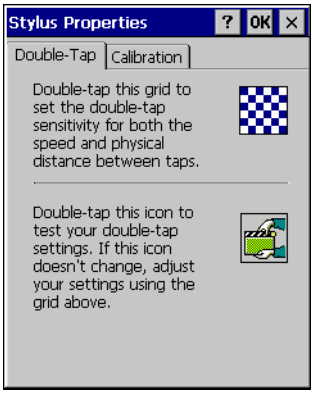


Figure 3-35. Stylus Properties - Double-Tap Tab

2. Select the *Double-Tap* tab.
3. Double-tap the checkerboard grid at a comfortable speed.
4. Double-tap the clapboard to test the settings.
5. Tap **OK** to apply changes.

Calibrate Tab

1. Select *Start - Settings - Control Panel*, and double-tap the *Stylus* icon.



Figure 3-36. Stylus Properties - Calibration Tab

2. Select the *Calibration* tab.
3. In the *Calibration* tab, tap **Recalibrate**.
4. Tap a targets and follow the on-screen messages.
5. Tap **OK**.

System

Use the *System Properties* window to view general system properties, change memory settings, input device name and view copyright information.

General Tab

The *General* tab view displays general system settings:

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *System* icon.
2. Select the *General* tab to view basic system and computer properties.

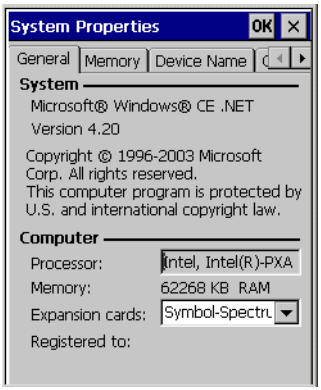


Figure 3-37. System Properties - General Tab

Memory Tab

Use the *Memory* tab to adjust the RAM allocation.

1. Select *Start - Settings - Control Panel*, and double-tap the *System* icon.
2. Select the *Memory* tab.

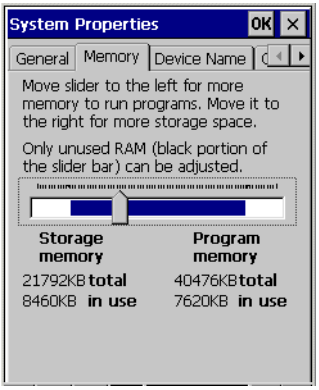


Figure 3-38. System - Memory Tab

3. To adjust RAM allocation move the slider to allocate more memory for programs or storage. If there is not enough space for a file, increase the amount of storage memory. If the mobile computer is running slowly, try increasing the amount of program memory.

Note

Programs supplied with the mobile computer are located in ROM and remain after a cold boot. User installed programs are located in RAM and need to be reinstalled after a cold boot. Adjust the RAM allocation as required for reinstalling user programs.

Device Name Tab

Use the *Device Name* tab to customize the device name and description.

1. Select *Start* - *Settings* - *Control Panel*, and double-tap the *System* icon.
2. Select the *Device Name* tab.

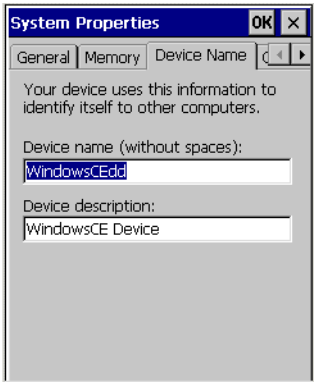


Figure 3-39. System Properties - Device Name Tab

3. Enter a device name for the mobile computer in the *Device name (without spaces):* field.
4. Enter a device description for the mobile computer in the *Device description:* field.

Copyrights Tab

The *Copyrights* tab displays relevant copyright information.

1. Select *Start - Settings - Control Panel*, and double-tap the *System* icon.
2. Tap the *Copyrights* tab to view the copyrights statement.

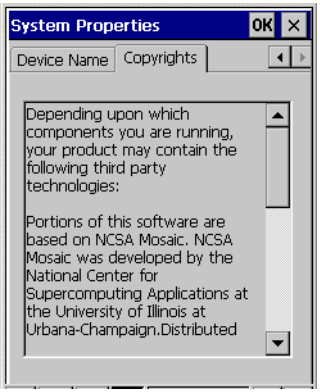


Figure 3-40. System Properties - Copyrights Tab

Series 9000 Demo Window

On mobile computer power up, the *Series 9000 Demo* window appears, this window is used to access the *Series 9000 Demo* window settings functions and the demo applications. Table 3-4 provides the settings functions icons and *Table 3-4 on page 3-39* provides the demo application icons.

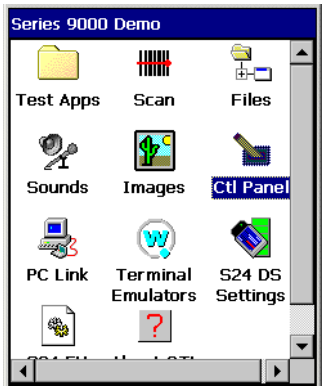


Figure 3-41. Series 9000 Demo Menu

Table 3-4. Series 9000 Demo Window, Settings Functions

Icon	Description
Ctl Panel	Displays the *Control Panel* window, see *Control Panel on page 3-40*.
S24 DS Settings	Displays the *Mobile Companion* window, see *Mobile Companion on page 6-4*.
S24 FH Settings	Displays the *S24 WLAN* window, see *Spectrum24 Frequency Hopping (FH) Settings (1 and 2 MB Radios) on page 6-30*.

Control Panel

Use the *Control Panel* to change settings for the mobile computer. From the *Series 9000 Demo* window, double-tap the *Ctl Panel* icon to display the *Control Panel* window.

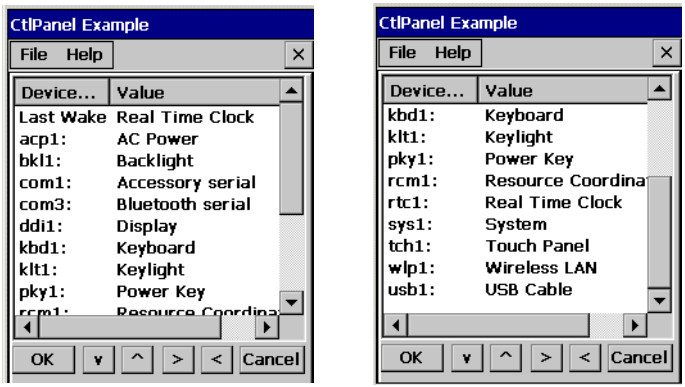


Figure 3-42. Control Panel Window

Table 3-5. Control Panel Menu

Menu Item	Description
About	Displays the Control Panel software information, see *About Ctl Panel on page 3-42*.
System Versions	Displays the system software information, see *System Version on page 3-43*.
Unique Unit ID	Displays the Unit ID software information, see *Unique Unit ID on page 3-44*.
Persist	Select the Persist setting, Yes or No, see *Persist on page 3-45*.
Battery	Displays the battery status information, see *Battery on page 3-46*.
Power settings	Select the Power settings, see *Power Settings on page 3-47*
Bluetooth Settings	Select the Bluetooth settings, see *Bluetooth Settings on page 3-51*.
Date and Time	Select the date and time settings, see *Date and Time on page 3-52*.
Touch Calibrate	Calibrate the touch panel, see *Calibration Screen on page 1-18*.
Printer Settings	Select the printer settings, see *Printer Settings on page 3-53*.
Comm Settings	Select the communication settings, see *Comm Settings on page 3-56*.
Display Settings	Select the display settings, see *Display Settings on page 3-57*
Audio Settings	Select the sound settings, see *Audio Settings on page 3-58*

Table 3-5. Control Panel Menu (Continued)

Menu Item	Description
Scanner Settings	Set scan parameters, see *Scanner Settings on page 3-59*.

About Ctl Panel

Use the *About Ctl Panel* window to view the system's control panel software version information.

1. Double-tap the *Ctl Panel* icon - double-tap *About*. The *About* window appears.



Figure 3-43. About Window

2. Tap **OK** to return to the *Control Panel* window.

System Version

Use the *System Version* window to view the system software versions.

1. Double-tap the *Ctl Panel* icon - double-tap *System Versions. The System Versions* window appears.

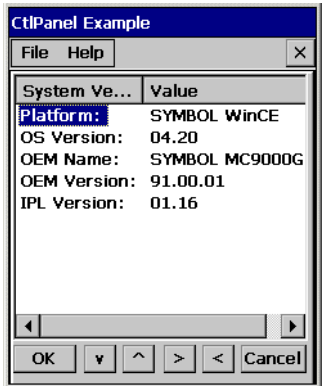


Figure 3-44. System Version Window

2. Tap **OK** to return to the *Control Panel* window.

Version data shown is example data only.

Note

Unique Unit ID

Use the *Unique Unit ID* (UUID) window to view the unique unit ID version information. The UUID provides a way of uniquely identifying each unit. Some software packages require a UUID.

1. Double-tap the *Ctl Panel* icon - double-tap *Unique Unit ID.* The *Unique Unit ID* window appears.

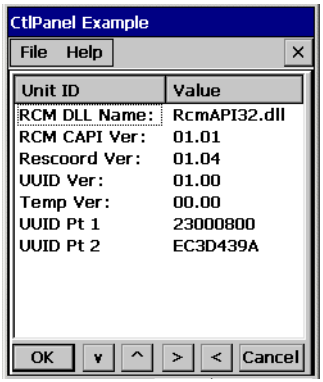


Figure 3-45. Unique Unit ID Window

2. Tap **OK** to return to the *Control Panel* window.

Persist

The *Persist* setting is made in the *Control Panel* window, see *Figure 3-42 on page 3-40*. It is used in conjunction with a parameter settings to save the new setting(s) in a .reg file in the */Applications* directory. Enable Persist prior to changing any settings if the settings are to be saved over a cold boot.

1. From the *Control Panel* window, tap *Persist*.
2. Use the right arrow [>] button to toggle the value to between *Yes* or *No*.

The created registration files can be found in the root directory of the application drive and the filenames are the same as the registry key names. For example, for a key called ZOT with a registry path of \HARDWARE\ONE\FUZZY the filename would be HARDWARE.ONE.FUZZY.ZOT.REG.

Battery

Use the *Battery* window to view the battery status.

1. Double-tap the *Ctl Panel* icon - double-tap *Battery*. The *Battery* window appears.

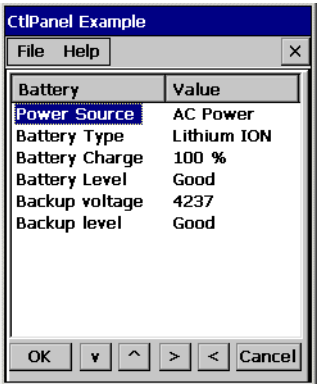


Figure 3-46. Battery Status Window

Note

Do not use the Backup voltage *value*.

2. Tap **OK** to return to the *Control Panel* window.

Power Settings

Use the *Power Settings* window to view and set the power setting parameters.

Double-tap the *Ctl Panel* icon - double-tap *Power Settings*. The *Power Settings* window appears.

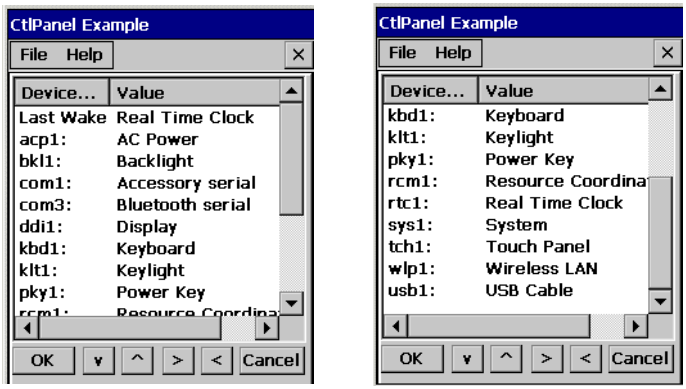


Figure 3-47. Power Settings Window

The device list as well as the he parameters settings is dependent on the mobile computer setup and configuration. However, the parameter types are defined.

The parameter types are:

- WakeUp control (Power key, Timeout, and API call) - typical sample device = acp1:
- Timeout control (Battery and AC power) - typical sample device = bkl1:
- State control (D0, D1, D2, D3, D4) - typical sample device = bkl1:
- Activity control (Trigger, Touch, Keyboard, User) - typical sample device = bkl1:

Use the power settings to set the individual power parameters, see Table 3-6 for parameter settings. Tap the up and down arrow buttons to scroll up or down on the menu selections and tap the left or right arrow buttons to select a menu item, or to toggle a selection value. The Keypad arrows perform the same functions as the arrow buttons. Tap **OK** to save any new selections and return to the previous window or tap **Cancel** to return to the previous window without saving any new entries.

Note

Use the power settings with caution. Some of the settings allow the user to turn off the display, or to disable the keypad/touch screen. If the unit is inadvertently disabled with the power settings, see *Resetting the Mobile Computer on page 2-39 to restore the factory settings.*

Table 3-6. Example Power Setting Parameters

Parameter	Value	Settings	
Last Wake	Real Time Clock	Displays the event that iintiated the last wake up.	
acp1:	AC Power	Power Key Wake Timeout Wake API Call Wake	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No
bkl1:	Backlight	Battery Timeout AC Power Timeout D0 D3 D4 Activities: Trigger Touch Keyboard User	60 (time value in ms) 0 (time value in ms) When selected feature is on When selected feature is on standby When selected feature is off Select Yes to set Activities to function on Battery Power and/or on AC Power. Select No to set activities not to function on Battery Power and/or on AC Power.
com1:	Accessory serial	Power Key Wake Timeout Wake API Call Wake D0 D3 D4	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No When selected feature is on When selected feature is on standby When selected feature is off
com3:	Bluetooth serial	Power Key Wake Timeout Wake API Call Wake D0 D3 D4	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No When selected feature is on When selected feature is on standby When selected feature is off
ddi1:	Display	D0 D4	When selected the Display is turned on When selected the Display is turned off

Table 3-6. Example Power Setting Parameters

Parameter	Value	Settings	
kbd1:	Keyboard	Power Key Wake Timeout Wake API Call Wake D0 D3 D4	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No When selected feature is on When selected feature is on standby When selected feature is off
klt1:	Keylight	Battery Timeout AC Power Timeout D0 D3 D4 Activities: Trigger Touch Keyboard User	60 (time value in ms) 0 (time value in ms) When selected feature is on When selected feature is on standby When selected feature is off Select Yes to set Activities to function on Battery Power and/or on AC Power. Select No to set activities not to function on Battery Power and/or on AC Power.
pky1:	Power Key	Display only	
rcm1:	Resource Coordinator	Power Key Wake Timeout Wake API Call Wake	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No
rtc1:	Real Time Clock	Display only	
sys1:	System	Battery Timeout AC Power Timeout	180 (time value in ms) 0 (time value in ms)
tch1:	Touch Panel	Power Key Wake Timeout Wake API Call Wake D0 D3 D4	Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No Set the Wake on=Yes, off=No When selected the Touch Panel is turned on When selected feature is on standby When selected the Touch Panel is turned off

Table 3-6. Example Power Setting Parameters

Parameter	Value	Settings	
wlp1:	Wireless LAN	Power Key Wake	Set the Wake on=Yes, off=No
		Timeout Wake	Set the Wake on=Yes, off=No
		API Call Wake	Set the Wake on=Yes, off=No
		D0	When selected feature is on
		D3	When selected feature is on standby
		D4	When selected feature is off
usb1:	USB Cable	Power Key Wake	Set the Wake on=Yes, off=No
		Timeout Wake	Set the Wake on=Yes, off=No
		API Call Wake	Set the Wake on=Yes, off=No

Bluetooth Settings

Use the *Bluetooth Settings* window to display the bluetooth parameters.

Note

Mobile computers that do not have Bluetooth capability display *UNKNOWN values.*

1. Double-tap the *Ctl Panel* icon - double-tap *Bluetooth Settings.* The *Bluetooth Settings* window displays.

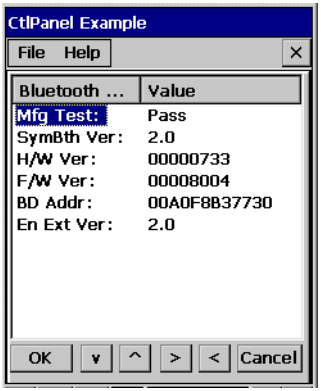


Figure 3-48. Bluetooth Status Window

2. Tap **OK** to return to the *Control Panel* window.

Date and Time

Use the *Date and Time* window to set the date, time and time zone information for the mobile computer.

1. Double-tap the *Ctl Panel* icon - double-tap *Date and Time.* The *Date and Time* window appears.

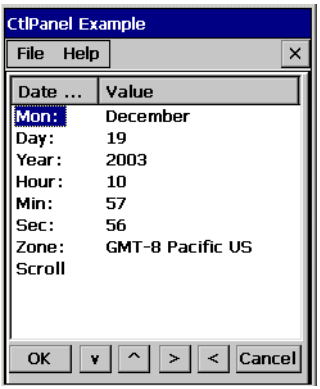


Figure 3-49. Date and Time Window

2. To set the *Value* for any item in the *Date and Time* column, use the up ^ and down ˅ arrows to select the item.
3. Use the left < and right arrow > buttons to select the value.
4. Tap **OK** to return to the *Control Panel* window.

Printer Settings

Use the *Printer Settings* window to select the printer information.

1. Double-tap the *Ctl Panel* icon - double-tap *Printer Settings*. The *Printer Settings* window appears.



Figure 3-50. Printer Settings Window

2. To select a printer, tap the *Selected Printer* item in the *Printer Settings* column.
3. Use the left < and right > arrows to select the printer. Available printer selections include:
   - QL420
   - Cameo_Series
   - Comtec_RP3
   - Encore_Series
   - Monarch9460
   - Monarch9490
   - QL320.

4. Double-tap *Printer Parameters* to enter the *Printer Parameters* window.

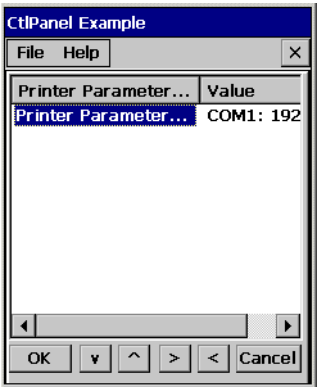


Figure 3-51. Printer Parameters Window

5. Tap the *Selected Printer* item in the *Printer Settings* column.
6. Use the left < and right > arrows to select the communication and baud rate. Values include:
   - Com1: 38400
   - Com1: 19200
   - Com1: 9600
   - Com2: 38400
   - Com2: 19200
   - Com2: 9600
   - Com3: 38400
   - Com3: 19200
   - Com3: 9600
   - Com4: 38400
   - Com4: 19200
   - Com4: 9600
   - LPT1:.

7. To view the *Version Information*, double-tap the *Version Info* item in the *Printer Settings* column.
8. Version information includes:
   - API Version
   - PDD Version
   - MDD Version
   - TIdVersion.

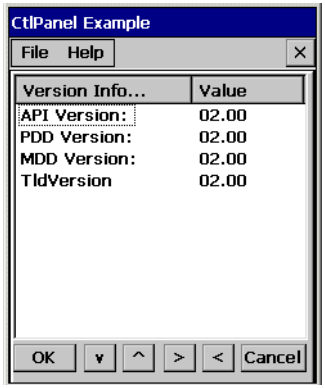


Figure 3-52. Printer Version Information Window

9. Tap **OK** to return to the *Control Panel* window.

Note

Developer support for adding additional Symbol printer drivers is provided in the SMDK, see Chapter 8, Software Installation for the SMDK installation.

Comm Settings

Use the *Comm Settings* window to select the communications settings.

1. Double-tap the *Ctl Panel* icon - double-tap *Comm Settings*. The *Comm Settings* window appears.

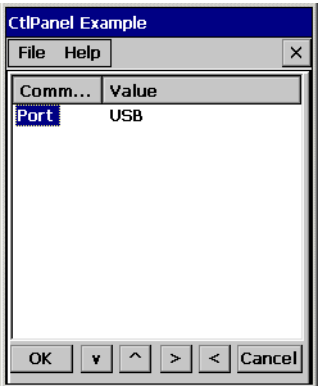


Figure 3-53. Comm Settings Window

2. With *Port* highlighted, use the left < and right arrow > buttons to select the appropriate communication setting. *Comm* port selection values are:
   - USB (default setting)
   - Serial1 @ 115200
   - Serial1 @ 57600
   - Serial1 @ 38400.
3. Tap **OK** to return to the *Control Panel* window.

Display Settings

Use the *Display Settings* window to set the display parameters.

1. Double-tap the *Ctl Panel* icon - double-tap *Display Settings*. The *Display Settings* window appears.

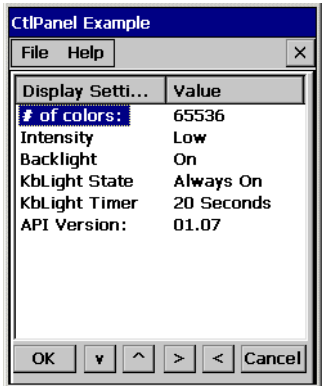


Figure 3-54. Display Settings Window

2. To set the *Value* for any item in the *Display Settings* column, use the up ^ and down v arrows to select the item.
3. Once the item in the *Display Settings* column is highlighted, use the left < and right arrow > buttons to select a value. Tap **OK** to return to the *Control Panel* window.

Table 3-7. Display Settings

Display Setting	Values
# of colors	65536
Contrast	0 to 15 (only on monochromatic units)
Intensity	Low, Medium, High, Super
Backlight	On, Off
kbLight State	Always off, Always on, Timeout
kbLight Timer	5 Sec, 10 Sec, 20 Sec, 30 Sec, 1 Min, 5 Min
API Version	01.07 (display only, not selectable)

Note

To optimize display performance, do not leave the display turned on to a fixed image for an extended period of time. Turn the mobile computer off, or use a screen saver when the mobile computer is not in use. Use the mobile computer Display Settings to automatically turn off the display when the unit is not in use, or use a screen saver application.

Audio Settings

Use the *Audio Settings* window to set the audio parameters.

1. Double-tap the *Ctl Panel* icon - double-tap *Audio Settings*. The *Audio Settings* window appears.



Figure 3-55. Audio Settings Window

2. Tap *Beeper Volume* in the *Audio Settings* column.
3. Use the left < and right arrow > buttons to select the volume value to 0, 1, 2, or 3.
4. *API Version* and *Notify API Version* are display values only.
5. Tap **OK** to return to the *Control Panel* window.

Scanner Settings

Use the *Scanner Settings* window to set the scanner information.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings*. The *Scanner Settings* window appears.

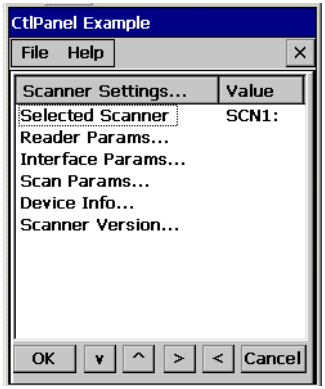


Figure 3-56. Scan Settings Window

2. To change any item in the *Scanner Settings* column, use the up ^ and down v arrows to select the item. *Selected Scanner* is a display only value.
3. Double-tap the item to open a new window.
   - *Reader Parameters*, see *Reader Parameters on page 3-60*.
   - *Interface Parameters*, see *Interface Parameters on page 3-61*.
   - *Scan Parameters*, see *Scan Parameters on page 3-62*.
   - *Device Information*, see *Device Information on page 3-65*.
   - *Scanner Version*, see *Scanner Version on page 3-66*.
4. Tap **OK** to return to the *Control Panel* window.

Reader Parameters

Use the *Reader Parameters* window to set the scanning read parameters.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings* - double-tap *Reader Parameters*. The *Reader Parameters* window appears.

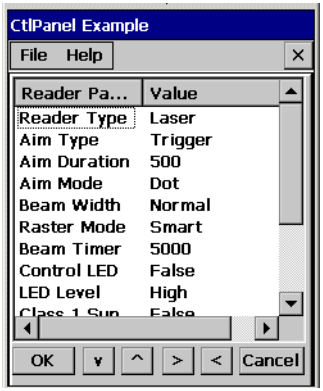


Figure 3-57. Reader Parameters Window

2. To change any item in the *Reader Parameters* column, use the up ^ and down v arrows to select the item.
3. Use the left < and right arrow > buttons to increment the value. Table 3-8 list the Reader Parameter value options.

Table 3-8. Reader Parameters

Reader Parameters	Values
Reader Type	Laser
Aim Type	Trigger, Timed hold, Timed Release
Aim Duration	0-60,000 in increments of 100
Aim Mode	Dot, Slab, Reticle, None
Beam Width	Normal, Narrow
Raster Mode	Smart, Cyclone, None, Always Open,
Beam Timer	0-60,000 in increments of 100
Control LED	False, True
LED Level	High, Low

Table 3-8. Reader Parameters (Continued)

Reader Parameters	Values
Class 1 Sup	False, True
Redundancy	None, Bidirectional
Linear Sec	(Short, Redun), (Short, Codabar), (All codes *2), (Long*2, Short*3), (All codes *3)
Pointer Timer	0-60,000 in increments of 100
Raster Height	0-100 in increments of 5

4. Tap **OK** to return to the *Control Panel* window.

Interface Parameters

Use the *Interface Parameters* window to set the scanning interface parameters.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings* - double-tap *Interface Parameters*. The *Interface Parameters* window appears

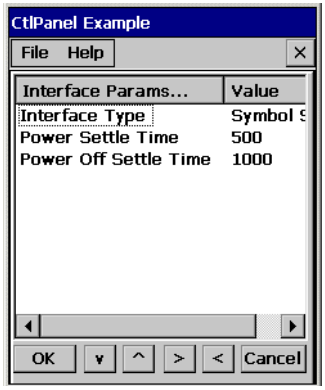


Figure 3-58. Interface Parameters Window

2. To change any item in the *Interface Parameters* column, use the up ^ and down v arrows to select the item.
3. Use the left < and right arrow > buttons to increment the value. Table 3-9 list the Reader Parameter value options.

Table 3-9. Interface Parameters

Interface Parameter	Values
Interface Type	Symbol SSI
Power Settle Time	0-1000 in increments of 50
Power Off Settle Time	0-1000 in increments of 50

4. Tap **OK** to return to the *Control Panel* window.

Scan Parameters

Use the *Scan Parameters* window to set the scan parameters.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings* - double-tap *Scan Params*. The *Scan Parameters* window appears.

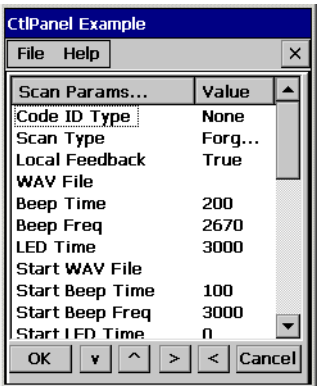


Figure 3-59. Scan Parameters Window

2. To change any item in the *Scan Parameters* column, use the up ^ and down v arrows to select the item.
3. Use the left < and right arrow > buttons to increment the value. Table 3-10 list the Scan Parameter value options.

Table 3-10. Scan Parameters

Scan Parameters	Values
Code ID Type	None, Symbol, AIM
Scan Type	Forgrnd, Bkgrnd, Monitor
Local Feedback	True, False
WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Beep Time	0-5000 in increments of 100
Beep Freq	2500-3500 in increments of 10
LED Time	0-5000 in increments of 500
Start WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Start Beep Time	0-5000 in increments of 100
Start Beep Freq	2500-3500 in increments of 10
Start LED Time	0-5000 in increments of 500
Interim WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Interim Beep Time	0-5000 in increments of 100
Interim Beep Freq	2500-3500 in increments of 10
Interim LED Time	0-5000 in increments of 500
Fatal WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Fatal Beep Time	0-5000 in increments of 100
Fatal Beep Freq	2500-3500 in increments of 10
Fatal LED Time	0-5000 in increments of 500

Table 3-10. Scan Parameters (Continued)

Scan Parameters	Values
Nonfatal WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Nonfatal Beep Time	0-5000 in increments of 100
Nonfatal Beep Freq	2500-3500 in increments of 10
Nonfatal LED Time	0-5000 in increments of 500
Activity WAV File	See *Figure 3-60 on page 3-64*, Tap **Decrement** to move back on the WAV file listing and **Increment** to move forward on the WAV file listing. Tap **OK** to select the WAV file.
Activity Beep Time	0-5000 in increments of 100
Activity Beep Freq	2500-3500 in increments of 10
Activity LED Time	0-5000 in increments of 500

4. Tap **OK** to return to the *Control Panel* window.

WAV File

Use the *WAV File* window to select a .wav file. Use the **Increment** and **Decrement** buttons to scroll through the wav file listing.

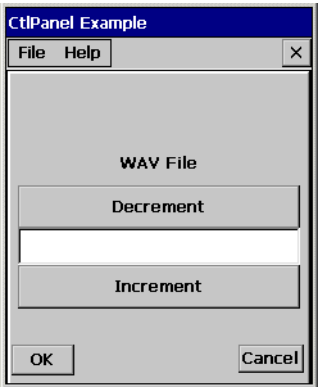


Figure 3-60. Scan WAV File Window

Tap **OK** to return to the *Control Panel* window.

Device Information

Use the *Device Information* window to view the scanner information.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings* - double-tap *Scan Parameters*. The *Scan Parameters* window appears.

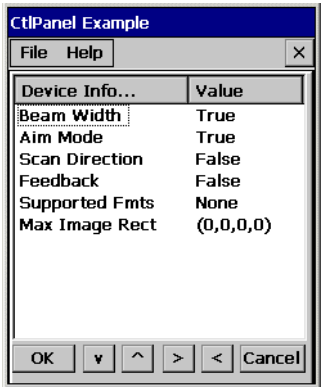


Figure 3-61. Device Information Parameters Window

2. To change any item in the *Device Information* column, use the up ^ and down v arrows to select the item.
3. Use the left < and right arrow > buttons to increment the value. Table 3-11 list the Reader Parameter value options.

Table 3-11. Device Information Parameters

Device Info Parameter	Values
Beam Width	True
Aim Mode	True
Scan Direction	False
Feedback	False
Supported Fmts	None
Max Image Rect	(0,0,0,0)

4. Tap **OK** to return to the *Control Panel* window.

Scanner Version

Use the *Scanner Version* window to view the scanner version information.

1. Double-tap the *Ctl Panel* icon - double-tap *Scanner Settings* - double-tap *Scanner Version.* The *Scanner Version* window appears.

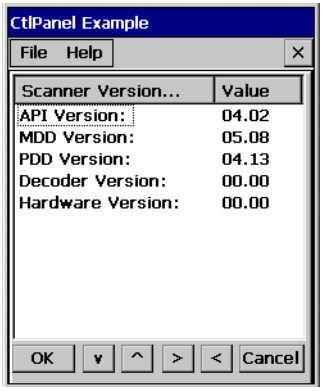


Figure 3-62. Scanner Version Window

2. To change any item in the *Scanner Version* column, use the up ^ and down v arrows to select the item.
3. Use the left < and right arrow > buttons to increment the value. Table 3-12 list the Reader Parameter value options.

Table 3-12. Version Parameters

Version Parameter	Values
API Version	04.02
MDD Version	05.06
PDD Version	04.11
Decoder Version	00.00
Hardware Version	00.00

4. Tap **OK** to return to the *Control Panel* window.

4 Communications

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Introduction

The mobile computer is capable of communicating with a number of hosts, including development computers, serial devices, printers, etc. The available accessories serve as essential data communication devices, enabling the information to be synchronized on the mobile computer with the information on the host device using ActiveSync. With the appropriate accessory and software, the mobile computer can establish a number of connection types, such as a serial connection, a USB connection and an Ethernet connection.

For an Ethernet connection, use the Four Slot Ethernet Cradle.

For a serial or USB connection, use one of the accessories listed below.

- Single Slot Serial/USB Cradle
- Cable Adapter Module (CAM)
- Magnetic Stripe Reader (MSR).

This chapter provides information on installing the appropriate communication software and setting up the appropriate accessory to enable communication between the mobile computer and the host device. For more information about the accessories available for the mobile computer, *Chapter 7, Accessories*.

Installing Communication Software

To successfully communicate with the various host devices Microsoft Activesync (version 3.7 or higher) must be installed on the host computer.

Installing ActiveSync

Use ActiveSync (version 3.7 or higher) to synchronize the information on the mobile computer with the information on the host computer. Changes made on the mobile computer or host computer appear in both places after synchronization.

ActiveSync software:

- Allows the user to work with mobile computer-compatible host applications on the host computer. ActiveSync replicates data from the mobile computer so data can be viewed, entered and modified on the mobile computer with the host application.
- Synchronize files between the mobile computer and host computer. The files are automatically converted to the correct format.
- Back up the data stored on the mobile computer. Synchronization is a one-step procedure that ensures the data is always safe and up-to-date.
- Copy (rather than synchronize) files between the mobile computer and host computer.
- Control when synchronization occurs by selecting a synchronization mode, e.g., set to synchronize continually while the mobile computer is connected to the host computer, or set to only synchronize on command.
- Select the types of information to synchronize and control how much data is synchronized.

To install ActiveSync on the host computer:

1. Download the latest version of the software from http://www.microsoft.com. Refer to the installation and RAS instructions included with the ActiveSync software.
2. Set up a partnership via the ActiveSync connection using a serial connection to the host computer.

Setting up a Partnership

After ActiveSync installation is complete, the ActiveSync Setup Wizard helps the user to connect the mobile computer to the host computer, set up a partnership to synchronize information between the mobile computer and host computer and customize synchronization settings.

Before setting up a partnership between the mobile computer and host computer, refer to the communication setup sections in this chapter for detailed information about Serial, USB and Ethernet communication setups.

To set up a partnership:

1. If the *Get Connected* window does not appear on the host computer, select *Start - Programs - Microsoft ActiveSync - File - Get Connected*.

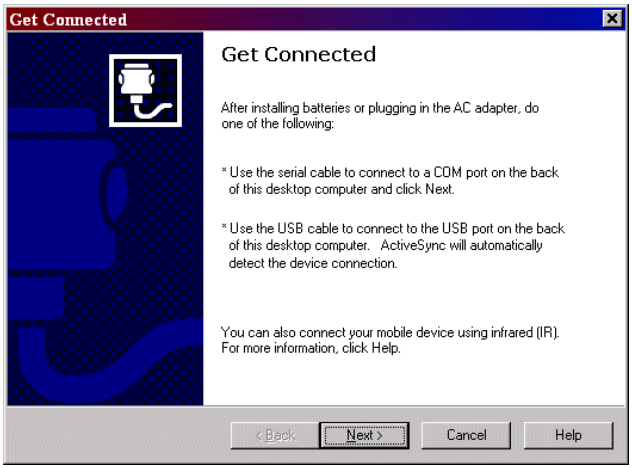


Figure 4-1. Get Connected Window

2. Connect the mobile computer to the host computer using the appropriate Serial connection (see *Chapter 7, Accessories*).
3. On the host computer, select **Next** in the *Get Connected* window.

4. The host computer and the mobile computer attempt to synchronize. The *New Partnership* window appears.

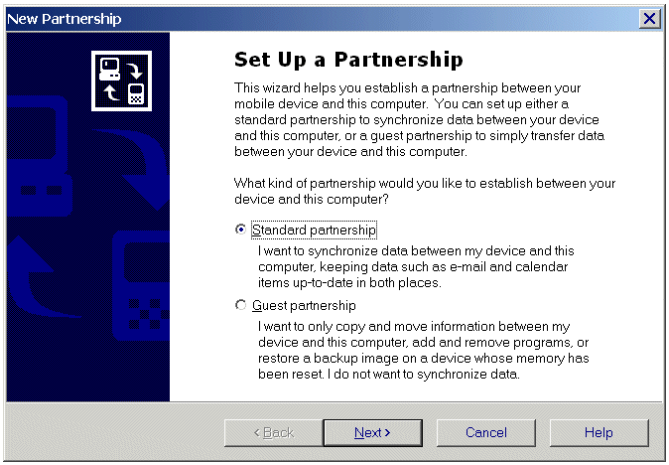


Figure 4-2. New Partnership Window

5. Click the *Standard partnership* radio button and then select **Next**. The *New Partnership/ Specify how to synchronize data* window appears.

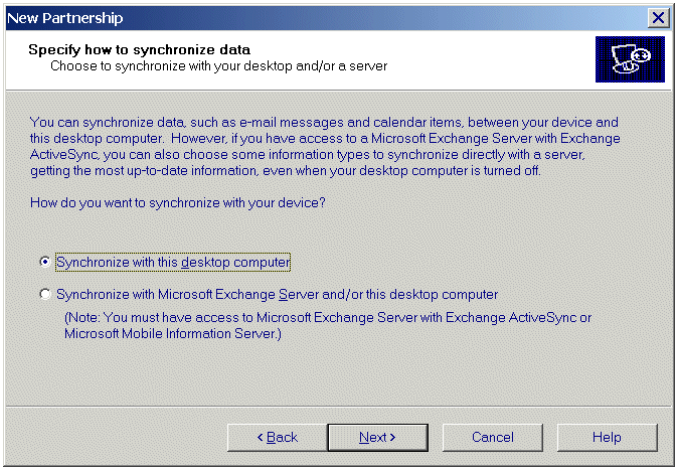


Figure 4-3. How To Sync Window

6. Click the *Synchronize with this desktop computer* radio button and select **Next**. The *New Partnership/Select Number of Partnerships* window appears.

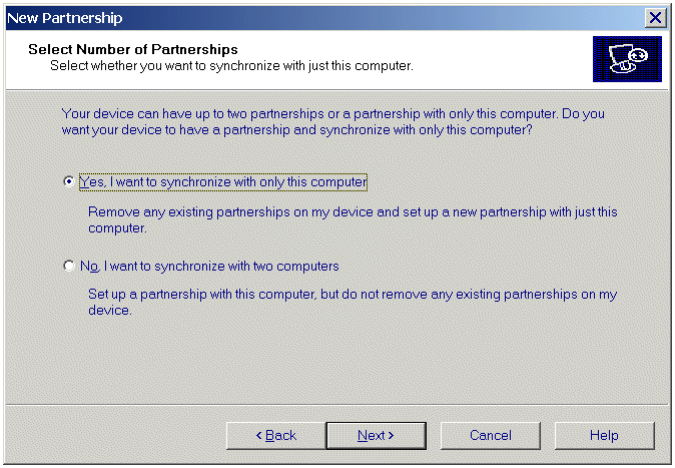


Figure 4-4. How To Sync Window

7. Click the *Yes, I want to synchronize with only this computer* radio button and then select **Next**. The *New Partnership/Select Synchronization Settings* window appears.

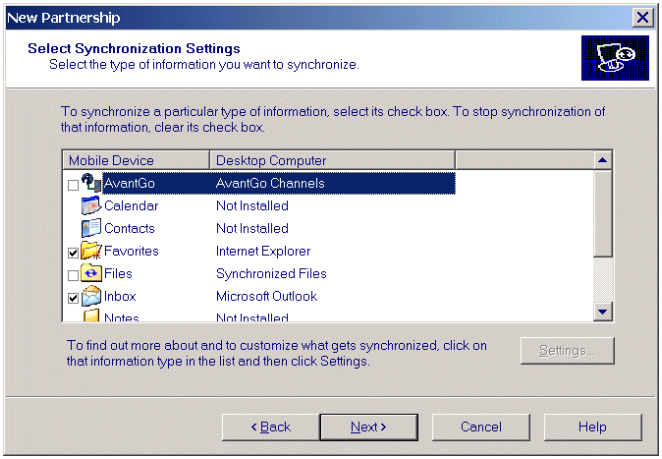


Figure 4-5. Select Synchronization Settings Window

8. To synchronize a particular type of information, select its check box. To stop synchronization of that information, clear its check box.

9. Select **Next**. The *New Partnership/Setup Complete* window appears.

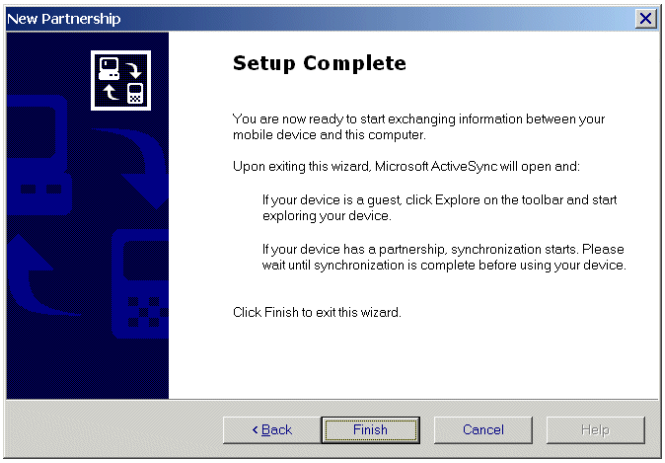


Figure 4-6. Setup Complete Window

10. Select **Finish**.



Figure 4-7. ActiveSync Connected Window

During the first synchronization, information stored on the host computer is copied to the mobile computer. When the copy is complete and all data is synchronized, the mobile computer can be disconnect from the host computer.



The first ActiveSync operation must be performed with a local, direct connection.
To retain partnerships after a cold boot, capture partnership registry information in a .reg file and save it in the Flash File System, detailed information is provided in the SMDK Windows CE Help File for Symbol Mobile Computers. See *Chapter 8, Software Installation* for the SMDK installation.

For more information about using ActiveSync, start ActiveSync on the host computer, then see ActiveSync Help.

Communication Setup

The mobile computer can communicate with the host computer using serial, USB or Ethernet communications. The communication setup procedures for the Single Slot Serial/USB Cradle and the Four Slot Ethernet Cradle are provided in this section as an example. See the provided reference for detailed procedures for setting up other accessories:

Serial or USB Connection:

- *Serial Communications Setup on page 4-10*
- *CAM and MSR Communications Setup on page 7-41*

Ethernet connection:

- *Ethernet Setup on page 4-16*.

For each accessory, follow the instructions on configuring the host computer, setting up the connection between the mobile computer and the host computer and configuring the mobile computer.

Serial Communications Setup

The serial communications setup can be used to set up to communicate with a Single Slot Serial/USB Cradle, MSR or a CAM.

Note

For serial communications using the Single Slot Serial/USB Cradle, connect only the serial cable, do not connect both the serial cable and the USB cable. If both serial and USB communications cables are required, the host computer USB port must be disabled in ActiveSync before serial communications can be enabled.

Serial Connection Setup

1. On the mobile computer double-tap the *Ctl Panel* icon and double-tap on *Comm Settings* to enter the *Comm Settings,* window. For detailed procedures, see *Comm Settings on page 3-56*.



Figure 4-8. Comm Settings Window

2. With *Port* highlighted, use the left < and right arrow > buttons to select the value. *Comm* port default value is set to *USB*, change the value to: Serial1 @ 115200 (or a serial setting appropriate for the host computer).
3. Tap **OK** to exit the *Comm Settings* window and tap **Exit** to exit the *Control Panel* window.
4. Ensure that ActiveSync was installed on the host computer and a partnership was created. See *Installing ActiveSync on page 4-3* and *Setting up a Partnership on page 4-4*.

5. Start ActiveSync if it is not running on the host computer. To start, select *Start - Programs - Microsoft ActiveSync*.



Figure 4-9. ActiveSync - Not Connected

6. In the *ActiveSync* window, select *File - Connection Settings* and ensure the selections shown in Figure 4-10 are made. (Select the appropriate COM port for the host computer.)

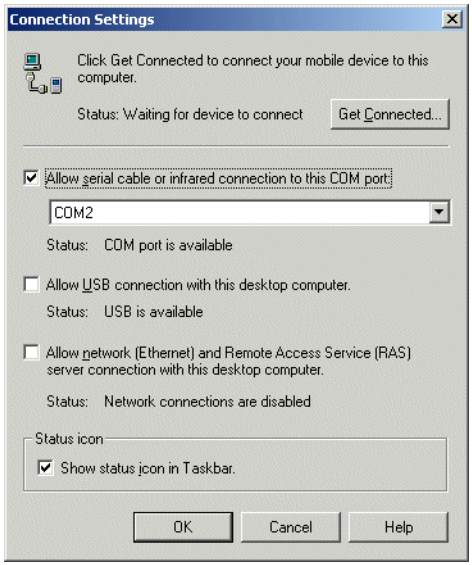


Figure 4-10. Serial Connection Settings

7. Tap **OK** to save any changes made.

Note

Every mobile computer should have a unique device name. Never try to synchronize more than one mobile computer to the same name.

8. Connect the device to the host computer, see *Figure 7-6 on page 7-12* to set up a Single Slot Serial/USB Cradle, or see *Figure 7-25 on page 7-37* to set up a MSR or a CAM.

Note

The cradle requires a dedicated port. It cannot share a port with an internal modem or other device. Refer to the computer user manual supplied to locate the serial port(s).

9. Upon connection, synchronization occurs automatically.

USB Connection Setup

1. The USB communications setup can be used to set up to communicate with a Single Slot Serial/USB Cradle, MSR or a CAM.
2. On the mobile computer double-tap the *Ctl Panel* icon and double-tap *Comm Settings* to enter the *Comm Settings,* window.

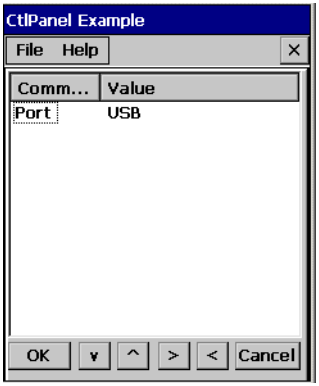


Figure 4-11. Comm Settings Window

3. Confirm that the *Comm* port default value is set to *USB*. If it is not set to *USB* then with *Port* highlighted, use the left < and right arrow > buttons to set the value to *USB*.
4. Tap **OK** to exit the *Comm Settings* window and tap **Exit** to exit the *Control Panel* window.
5. Ensure that ActiveSync was installed on the host computer and a partnership was created. See *Installing ActiveSync on page 4-3* and *Setting up a Partnership on page 4-4*.

6. Start ActiveSync if it is not running on the host computer. To start, select *Start - Programs - Microsoft ActiveSync*.

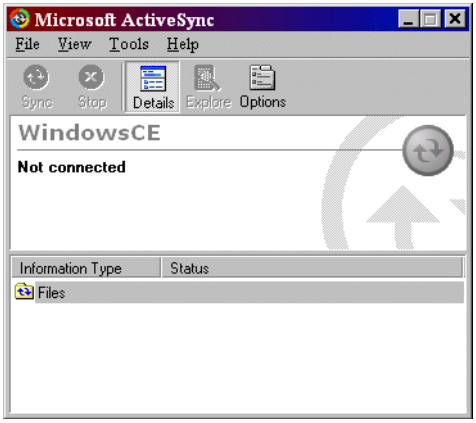


Figure 4-12. ActiveSync - Not Connected

7. In the *ActiveSync* window, select *File - Connection Settings* and ensure the selections shown in Figure 4-13 are made. Select *USB* port for the host computer.)

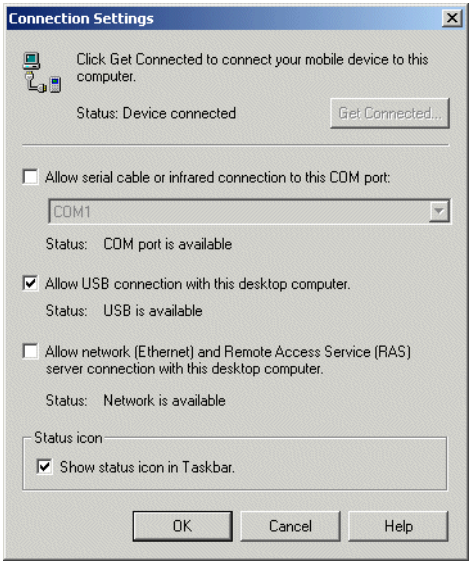


Figure 4-13. USB Connection Settings

8. Tap **OK** to save any changes made.

Note

Every mobile computer should have a unique device name. Never try to synchronize more than one mobile computer to the same name.

9. Connect the device to the host computer, see *Figure 7-6 on page 7-12* to set up a Single Slot Serial/USB Cradle, or see *Figure 7-25 on page 7-37* to set up a MSR or a CAM.

Note

The cradle requires a dedicated port. It cannot share a USB port with any other device. Refer to the computer user manual supplied to locate the USB(s).

10. Upon connection, synchronization occurs automatically.

Using ActiveSync

1. Review the configuration of the cradle using the MobileDox Cradle Manager.
   a. A WIN server must be present on your network. Ensure that the WINS Address provided in the TCP/IP Settings tab matches the IP address of the WIN server on your network.
   b. Ensure that the *Use NAT* checkbox is not selected in the Port Settings tab.
2. Insert the terminal into the cradle. The mobile computer displays a succession of dialog boxes appear, indicating the status of the connection. Also the ActiveSync icon on the host computer's system tray turns green to indicate that the host computer and the mobile computer are communicating.

Ethernet Setup

The Ethernet connection can only be established with the Four Slot Ethernet cradle. To establish a connection between the mobile computer and the host computer to communicate over an Ethernet network, perform the following:

- Install MobileDox Cradle Manager
- Install eConnect
- Mobile computer configuration
- Host computer configuration
- DHCP server configuration
- Cradle configuration.

Installing MobileDox Cradle Manager



MobileDox Cradle Manager is used only when establishing a connection using the Four Slot Ethernet Cradle.

The Cradle Management software features:

- View cradles that are attached to the network via MobileDox Net
- View cradle status
- Modify cradle settings including:
  - IP address settings
  - DNS and WINS settings
  - Identification settings
  - USB port specific settings
- Restart cradles connected to the network via MobileDox Net
- Update the firmware of MobileDox Net.

To install the Cradle Management Software on the host computer, download the latest version of the software from http://devzone.symbol.com. Refer to the instructions included with the software.

Installing eConnect

Note

eConnect is used only when establishing a connection using the Four Slot Ethernet Cradle.

1. To install the eConnect on the mobile computer, download the latest version of the software on to the host computer (from http://devzone.symbol.com).
2. On the mobile computer copy the eConnect *.cab* file to the */Application* directory.

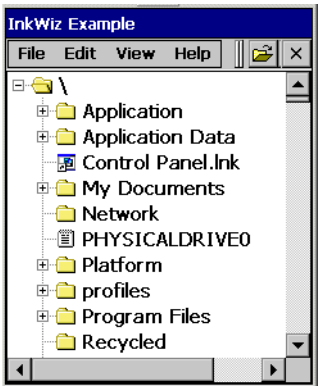


Figure 4-14. Copy eConnect .cab File Window

3. Double-tap the eConnect .cab file, the eConnect install window appears. Double -tap **OK**.

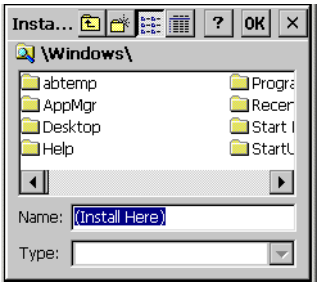


Figure 4-15. eConnect Install Window

4. Double-tap the *Files* icon, open the *Windows* directory and double-tap the *control.lnk* file the *eConnect Icon* window appears.

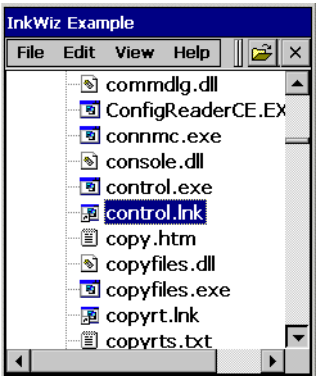


Figure 4-16. Windows Directory, control.lnk File

5. Double-tap the *eConnect* icon, the *eConnect Properties* window appears.

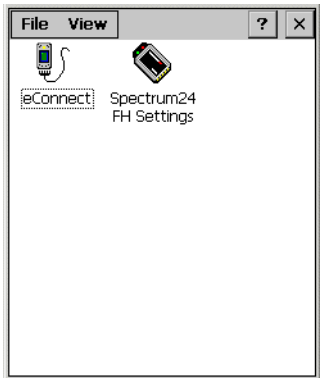


Figure 4-17. eConnect Icon Window

6. Tap the Establish TCP/IP Connection checkbox and select USB from the Serial Port Baud Rate drop down menu. Double-tap **OK** to enter the settings and complete the eConnect installation.

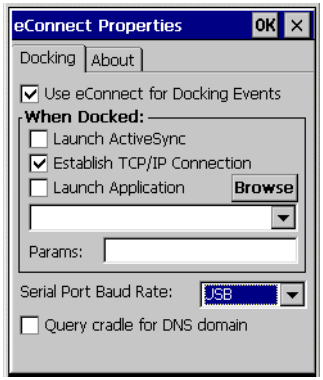


Figure 4-18. eConnect Properties Window

Mobile Computer Configuration

Inserting the mobile computer into the cradle provides direct-connect RAS service. Configure each mobile computer for use with the cradle, just as any remote client would be configured to connect to an Internet Service Provider (ISP). See *Persist on page 3-45* to save the settings to the registry.

The computer comm port to setting was set to USB during the eConnect installation procedure. To confirm the setting:

1. On the mobile computer double-tap the *Ctl Panel* icon and double-tap *Comm Settings* to enter the *Comm Settings,* window.

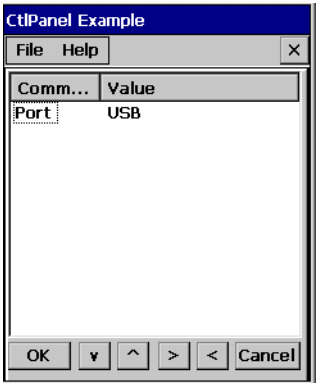


Figure 4-19. Comm Settings Window

2. Confirm that the Port Value is set to USB. To change the setting tap *Port* to highlight and use the left < and right arrow > buttons to select the USB value.
3. Tap **OK** to exit the *Comm Settings* window and tap **Exit** to exit the *Control Panel* window.

Host Computer Configuration

The host computer must be setup with the appropriate communication software and connection settings. This describes using Microsoft® ActiveSync software on both the terminal and the host computer. To configure the host computer:

1. Download and install *ActiveSync*. See *Installing ActiveSync on page 4-3*.
2. Configure the connection settings. The host computer must be configured for TCP/IP network communications.
   a. Click the *ActiveSync* icon
   b. Click on *File - Connection settings*
   c. In the *Connection settings* dialog box, select the *Allow Network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer* option.
   Other options may be selected, for example, *Allow serial cable or infrared connection to this COM port*.
3. Click **OK**.



Before communicating through an ethernet connection, create a partnership between the mobile computer and the host computer. See *Setting up a Partnership on page 4-4* for detailed instructions.

DHCP Server Configuration

If you use a DHCP server to distribute IP addresses and other network parameters, setup the server as following:

- IP address pool (1 or 5 IP address per cradle)
- Router/gateway address
- One or more DNS server addresses
- One or more WINS server addresses
- Subnet mask.



To assign the initial cradle IP address, you can either use a DHCP server, as shown above, or use the MobileDox Cradle Manager, see *Installing MobileDox Cradle Manager on page 4-16*. DHCP server is the preferred method.

Cradle Configuration

The MobileDox Cradle Manager allows you to setup the Device IP Address and modify cradle settings. See *Installing MobileDox Cradle Manager on page 4-16* for instructions to download and install the software. To connect the cradle, see *Four Slot Ethernet Cradle on page 7-28*.

Setting the Device IP Address

By default, the cradle will use DHCP to obtain its IP address. However, if DHCP fails, the Cradle Manager can assign an IP address.



This is used if the cradle is connected to the network, but fails to appear in MobileDox. Enter the hardware device (MAC) address to locate the cradle and assign it a new IP address.

1. Launch the MobileDox Cradle Manager on your host computer.
2. Click *File - Set IP Address of Unlisted Device*. The following screen appears:

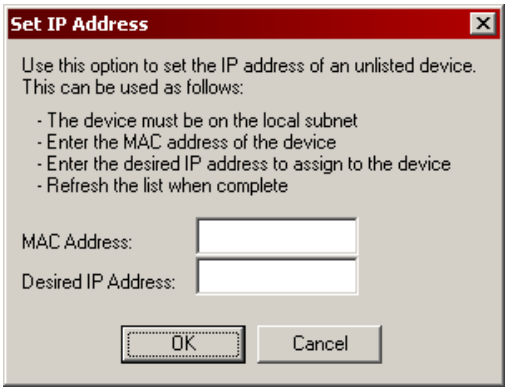
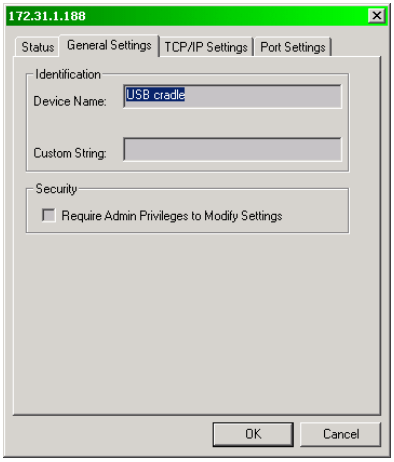


Figure 4-20. MobileDox, Set IP Address of Unlisted Device Window

3. Enter the appropriate MAC Address and IP address.
4. Click **OK**.

Modifying Cradle Settings

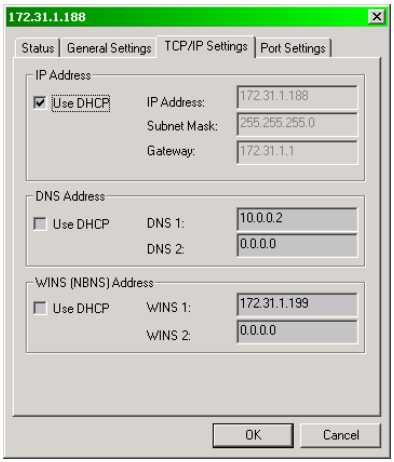
1. Launch the MobileDox Cradle Manager on your host computer.
2. Select the name of the cradle you want to configure from the list.
3. Click *Device - Modify Settings*.
4. Use the *General Settings* tab to modify the identification settings of the cradle.



Field	Description
Device Name	A text string used to describe the MobileDox device. Any 15-character string may be entered.
Custom String	A text string for any desired usage (examples are: location, asset ID, etc.). Any 15-character string may be entered.
Require Admin Privileges to Modify Settings checkbox	Selecting this checkbox will require users to have administrative privileges in order to modify MobileDox settings. Administrative privileges are validated using standard Windows authentication.

Figure 4-21. MobileDox, General Settings Window

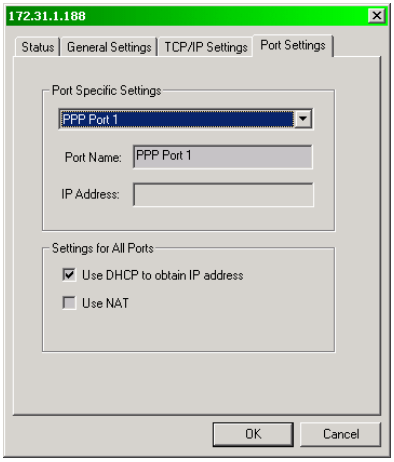
5. Use the *TPC/IP Settings* tab to modify the DNS and WINS identification settings of the cradle.



Field	Description
Use DHCP	If checkbox is selected, necessary information will be retrieved from the DHCP server. If checkbox is not selected, static configuration will be used (information needs to be entered).
IP Address	The IP address that the MobileDox will use when communicating on the network.
Subnet Mask	The subnet mask that the MobileDox will use when communicating on the network.
Gateway Address	The IP address that the MobileDox will use to send non-local IP network data.
DNS Address	The IP address of a server(s) that can resolve Internet names into IP addresses.
WINS Address	The IP address of a server(s) that can resolve Windows network names into IP addresses. This field must be populated correctly when using ActiveSync.

Figure 4-22. MobileDox, TPC/IP Settings Window

6. Use the *Port Settings* tab to modify the USB port settings of the cradle.



Field	Description
Port Name	A text string used to describe the device attached to the port. Any 15-character string can be entered. You can specify up to four port names, one for each of the cradle's slots.
IP Address	The IP address assigned to the cradled device. There should be one IP address per cradle slot. This box will be disabled for all devices if DHCP is used to obtain the IP address.
Use DHCP to obtain IP Address checkbox	The cradle will use DHCP to obtain an IP address for the handheld. Unchecking this selection allows the cradle to use Static IP address for the handheld.
Use NAT checkbox	The cradle will use Network Address Translation (NAT) when forwarding handheld traffic onto the network. No IP addresses are necessary for the handhelds. This must be disable when using ActiveSync.

Figure 4-23. MobileDox, Port Settings Window

7. Click **OK**.

Connecting to the Internet on a Wireless Network

The mobile computer can connect to the Internet across a wireless network. To set up a wireless connection:

1. Tap the *Mobile Companion* icon , on the taskbar.
2. Tap *Find WLANs*. The Mobile Companion window appears.

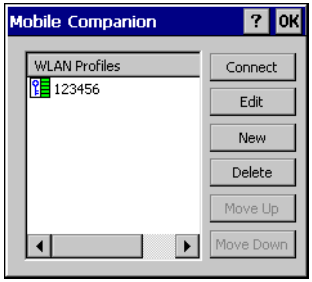


Figure 4-24. Find WLANs Window

3. The mobile computer tries to locate Access Points (APs) in the area. When it locates a wireless LAN(s), the ESSID name appears in the WLAN Profile list.
4. Tap the ESSID name and then tap **Connect**.
5. The Mobile Companion *Mode* tab appears.

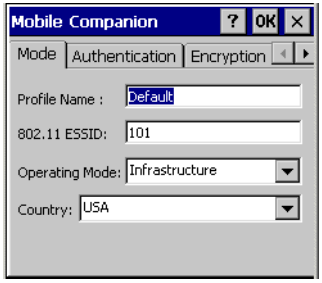
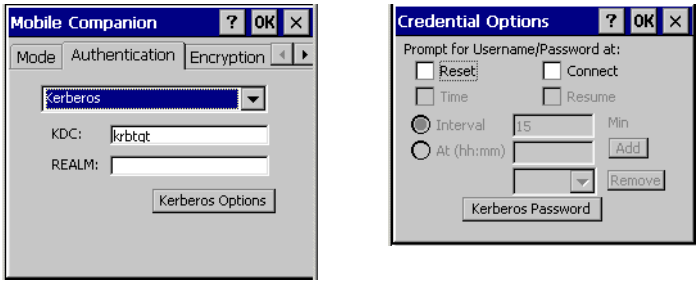


Figure 4-25. Mobile Companion - Mode Tab

6. The profile name and ESSID name appears in the respective fields.
7. In the *Operating Mode:* list, select *Infrastructure*.

8. Select the *Authentication* tab to configure server-based authentication through IEEE 802.1x or Kerberos. Select an option (None, Kerberos, LEAP, EAP-TLS, PEAP) from the *Authentication* drop-down list.



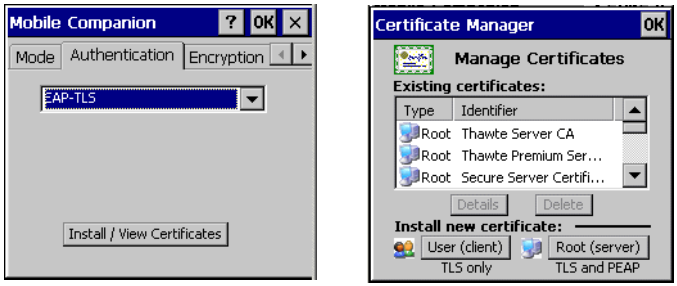
Kerberos Authentication

Credential Caching Settings (Kerberos Options)

Figure 4-26. Mobile Companion - Authentication Tab (Kerberos)

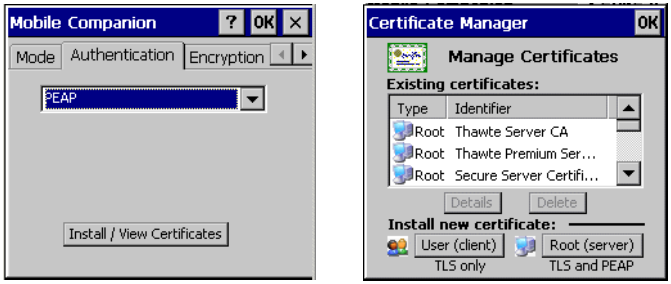


Figure 4-27. Mobile Companion - Authentication Tab (LEAP)



EAP-TLS Authentication Install / View Certificates

Figure 4-28. Mobile Companion - Authentication Tab (EAP-TLS)



PEAP Authentication Install / View Certificates

Figure 4-29. Mobile Companion - Authentication Tab (PEAP)

9. Select the *Encryption* tab to set the adapter profile security level by configuring the encryption scheme and corresponding keys. Select an option (Open System, WEP, Keyguard-MCM, TKIP (WPA)) from the *Encryption* drop-down list. See *Table 6-7 on page 6-14* for Encryption option descriptions.



Figure 4-30. Encryption Tab

The absence of a physical connection makes wireless links vulnerable to information theft. Encryption is an efficient method of preventing data theft and improving data security.

If an AP is set to 40-bit and an adapter is set to 128-bit, the adapter can associate to the AP, but no data transmission and reception can take place.

10. Select the encryption algorithm used on the wireless network (Open System, 40-bit Shared Key, 128-bit Shared Key or Kerberos).

    To select 40-bit Shared Key, 128-bit Shared Key or Kerberos, enter the required data in the fields that appear in the window. See the network administrator for this information.

11. Tap the *IP Config* tab.

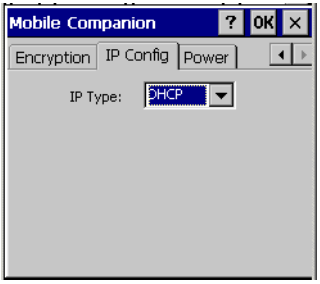


Figure 4-31. Mobile Companion - IP Config Tab (DHCP)

12. In the *IP Type* drop-down menu, select either *DHCP* or *Static*. To select static IP, enter the required data in the fields that appear in the window. See the network administrator for this information.
13. Tap **OK** and Tap **OK**.
14. The Mobile Companion wireless status icon indicates that the mobile computer is connected to the AP. If the status icon does not indicate that the mobile computer is connected to the AP, see the system administrator.
15. Select *Start - Programs - Internet Explorer.*
16. In the address bar, enter the URL.

5

Applications

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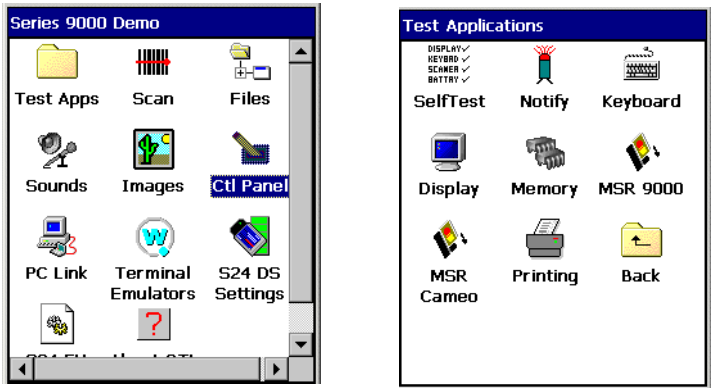
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Introduction

Two type of applications are provided. Example applications provide the application developer with sample applications that can be used to assist in application development. The source code is available for these applications in the *Symbol Windows CE SMDK for Series 9000*. The remaining applications are supplied to provide additional mobile computer functionality.

Double-tap the application icon to open the application. The application icons are available in the *Series 9000 Demo* window and in the *Test Applications* window. The *Series 9000 Demo* window is the default menu when the unit is turned on. Double-tap the *Test Apps* icon on the *Series 9000 Demo* window to access the *Test Applications* window. Double-tap the *Back* icon to return to the *Series 9000 Demo* window. The *Series 9000 Demo* window icon functions are provided in Table 5-1.



Series 9000 Demo Window

Test Applications Window

Figure 5-1. Applications Windows

Table 5-1. Applications

Icon	Description
 Scan	Displays the *ScanSamp2* example application that is used to set up and run the example scan application, see *ScanSamp2 on page 5-6*.
 Files	Displays the *InkWiz* sample application. This file browser displays the system's file structure, see *InkWiz File Browser on page 5-9*. The file browser is also used to access the following applications: • *Internet Explorer on page 5-10* • *Remote Desktop on page 5-12*.
 Sounds	Displays the *AudioSamp* sample application, see *AudioSamp on page 5-13*.
 Images	Displays the image viewer sample application, see *Images on page 5-14*.
 PC Link	PC Link accesses the Microsoft ActiveSync application, see *PC Link on page 5-16*.
 About OTL	Displays the *OTL* version information example application, see *About OTL on page 5-17*.
 SelfTest	Displays the self test application, see *Self Test on page 5-18*.
 Notify	Displays the notify example application, see *Notify on page 5-21*.
 Keyboard	Displays the keyboard example application, see *Keyboard on page 5-22*.
 Display	Displays the display example application, see *Display on page 5-23*.
 Memory	Displays the memory example application, see *Memory on page 5-24*.
 MSR 9000	Displays the MSR 9000 setup application, see *MSR9000 on page 5-25*.

Table 5-1. Applications (Continued)

Icon	Description
 MSR Cameo	Displays the MSR 9000 Cameo setup application, see *MSR Cameo on page 5-26*.
 Printing	Displays the Printer application, see *Printing on page 5-27*.

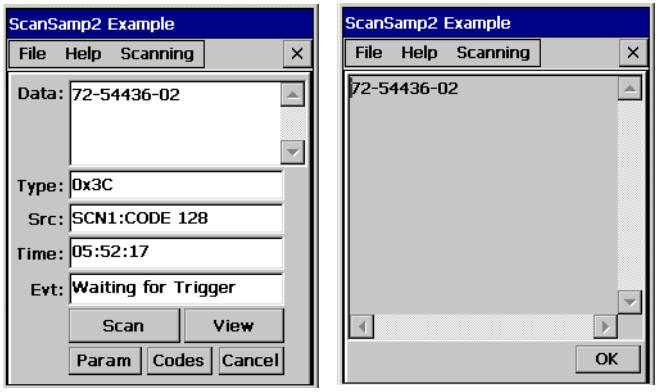


The windows shown are configured as part of the factory default demo program (OTL.exe). OTL.exe can be configured via registry settings to user specified applications.

ScanSamp2

Use the *ScanSamp2* example application to enable the mobile computer's scanner and display scanned data. It also allows the user to change the scan parameters.

From the *Series 9000 Demo* window, double-tap the *Scan* icon.



ScanSamp2 Window View Window

Figure 5-2. ScanSamp2 Examples

ScanSamp2 Windows

After a bar code is scanned, the following data displays in the scan window:

- *Data* - Displays the data encoded in the scanned bar code.
- *Type* - Indicates the hex type scanned.
- *SRC* - Indicates the scanner used and the bar code type scanned (e.g., Code 128).
- *Time* - Displays the time the bar code was scanned.

Tap **Scan** to start the scanner (alternative to pushing the scan button).

Tap **View** to display the bar code content in a separate window.

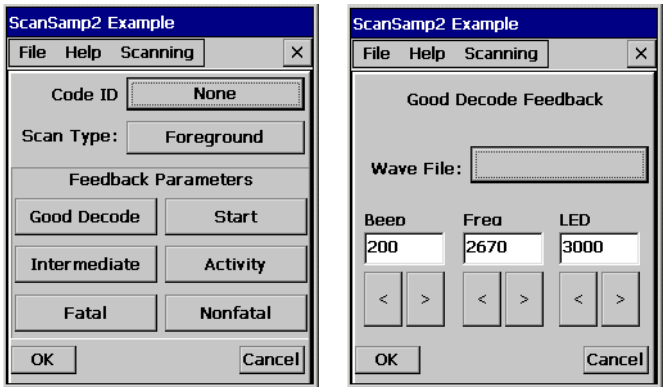
Tap **Param** to display the Parameters window, see *Parameters Window on page 5-7*.

Tap **Codes** to display the Selected Bar Code window, see *Codes Window on page 5-8*.

Parameters Window

The *Parameters* window is used to set the scan parameter.

- Tap *Code ID* to select the code ID value (None, Symbol, AIM).
- Tap *Scan Type* to select the scan type (Background, Foreground, Monitor).
- Tap *Feedback Parameters* to select the feedback parameters category (**Good Decode**, **Intermediate**, **Fatal**, **Start**, **Activity**, **Nonfatal**). All of the parameter categories use the same format Parameters Input Window, see Figure 5-3.
- To change the beep wave file enter a new path and name into the Wave File box. Use the left < and right > arrow buttons to set the values for the *Beep*, *Freq* and *LED*. Note, units that do not have the optional .wav file capability can not use the new .wav file setting.



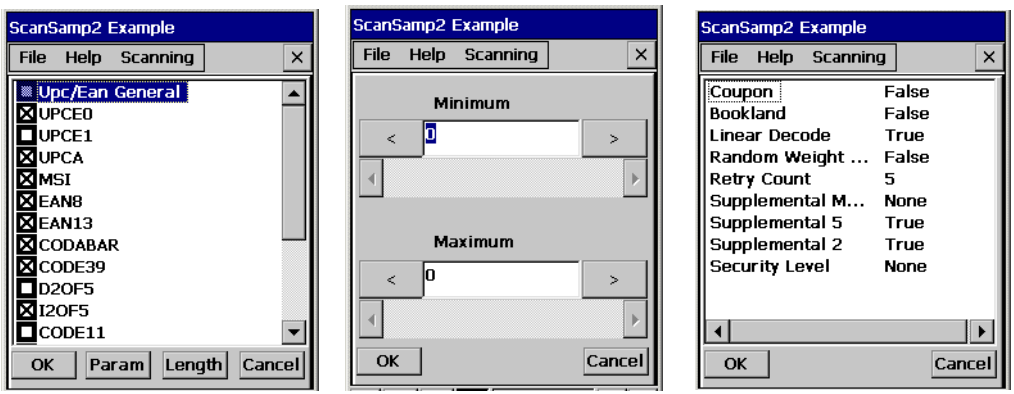
Parameters Window Parameters Input Windows

Figure 5-3. ScanSamp2 Examples

Codes Window

The *Codes* window is used to set the scan type parameter.

- Tap **Param** to select the code types, tap in the box to select a code type.
- To set parameters for a code type, tap the code type to highlight it and then tap **Param** to display the Code Parameters Sample Window, see Figure 5-4. Different code types will have parameter settings specific to that code type, so the windows will differ.
- To set length for a code type, tap the code type to highlight it and then tap **Length** to display the code length sample window, see Figure 5-4. Different code types will have length settings specific to that code type, so the setting windows will differ.



Codes Window | Code Parameters Sample Window | Code Length Sample Window

Figure 5-4. ScanSamp2 Examples

InkWiz File Browser

Use the *InkWiz* file browser example application to browse, cut, copy, paste, delete files and to execute programs.

From the *Series 9000 Demo* window, double-tap the *Files* icon. The *InkWiz Example* window appears.

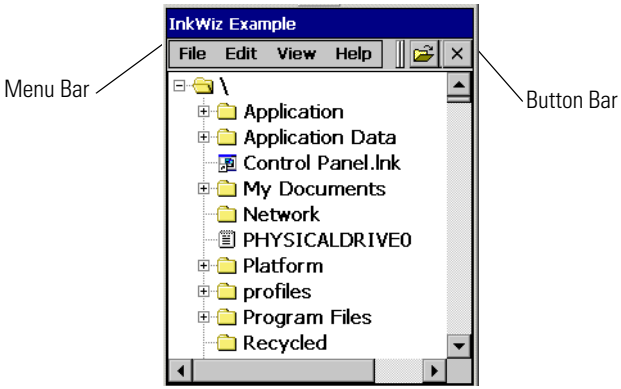


Figure 5-5. InkWiz Example Window

The *Menu Bar* and *Button Bar* are used to navigate organize files on the mobile computer.

Internet Explorer

Use *Internet Explorer*, to view Internet or intranet Web pages on the mobile computer. A modem, an Ethernet connection or a Spectrum24 connection is required to connect to an Internet service provider (ISP) or network.

From the *Series 9000 Demo* window, double-tap *Files* icon - double-tap on *Application* - double-tap *IEBrowser.exe*. The *Internet Explorer window appears*.

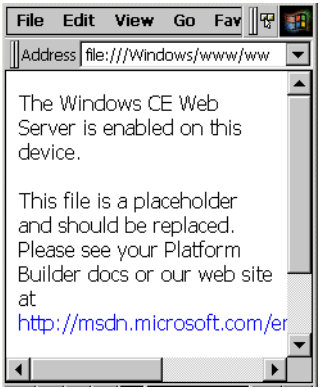


Figure 5-6. Internet Explorer Window

Browsing the Web

To browse the Web:

1. Connect to a network using a wireless connection. See *Connecting to the Internet on a Wireless Network on page 4-27*.
2. Once connected, go to a specific Web page in one of the following ways:
3. Use the keypad to enter the web address In the address bar, press the **ENT** key.
4. Tap the address bar drop-down arrow to select a previously entered addresses.
5. To end the connection, select *File - Close*.

Note

If Internet Explorer is selected before setting up the network connections, a window may appear to proceed to the connection settings window.

Setting up a Proxy Server

Proxy servers are often used when connecting to the Internet through a local network, such as a corporate network, for added security. To set the proxy server settings:

1. From the menu bar, select *View - Options - Proxy Server* tab.
2. Select *Use Proxy Server*.
3. Enter the proxy server address and port. For more information, see the network administrator.
4. To bypass the proxy server for local addresses, such as corporate intranet pages, select *Bypass Proxy for Local Addresses*.
5. Tap **OK**.

Remote Desktop

Use *Remote Desktop* connection to log onto a Windows Terminal Server and to use the programs installed on the server. For example, instead of running Microsoft Pocket Word, the desktop version of Microsoft Word can be run.

Connecting to a Terminal Server

To connect to a terminal server:

1. From the Series 9000 Demo window double-tap on *Files icon - Windows - Desktop* double-tap on *Remote Desktop Connection.lnk*, or run 'MSTSC' from the command prompt. The initial Remote Desktop Connection window appears.

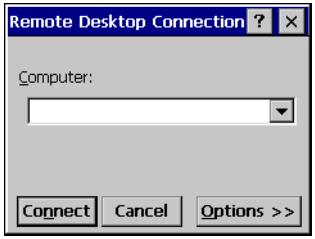


Figure 5-7. Remote Desktop Connection Window

2. In the *Computer* drop-down list, type a Terminal Server name or TCP/IP address, or select a server and tap **Connect**.
3. In the next *Remote Desktop Connection* window, type the user name, password and domain (if required) and then tap **OK**.

Disconnecting Without Ending a Session

To disconnect a session:

1. In the *Remote Desktop Connection* window, select *Start - Shutdown.*
2. Tap **Disconnect.**
3. Tap **OK**.



If Terminal Server was disconnected from without ending the session, the Terminal Server will continue to execute any running processes. Remote Desktop Connection can later reconnect to this same session (if the administrator configured Remote Desktop Connection to reconnect to disconnected sessions).

Disconnecting and Ending a Session

To end a session:

1. In the *Remote Desktop Connection* window, select *Start - Shutdown.*
2. Tap **Log Off.**
3. Tap **OK**.

AudioSamp

Use the *AudioSamp* application as an example of how to work with audio files such as recording and playback. The *AudioSamp* application can only be used on mobile computers that have the audio enabled option.

1. From the Series 9000 Demo window, double-tap the *Sounds* icon. The *AudioSamp Example* window appears.

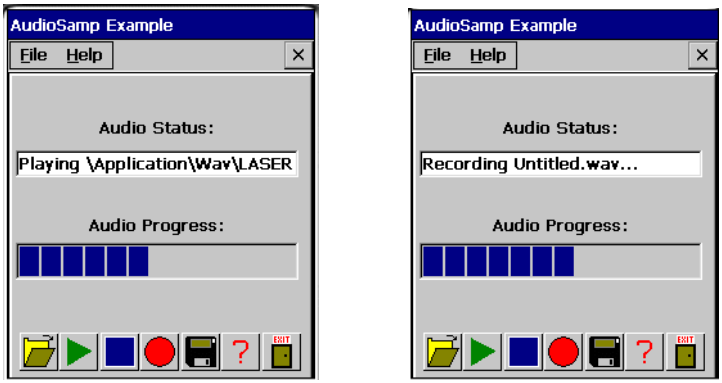


Figure 5-8. AudioSamp Application Window

2. Tap the file folder to access the sounds files. The default directory location is *\Application\Wav* this directory provides .wav files that can only be used on the units that have the optional .wav file capability. For units that do not have the optional .wav file capability select .wav files from the *\Platform\Alias* directory.
3. Double-tap a file name to select the .wav file.
4. Tap the green triangle button to play the file.
5. Tap **Exit** to return to the *Series 9000 Demo* window.

Images

Use the *Images* application as an example of how to work with image files, panning, zooming, saving and reading.

1. From the *Series 9000 Demo* window, double-tap the *Images* icon. The *ImagesViewer Example* window appears..



Figure 5-9. Image Window

2. Select the folder icon to display the contents of the images folder.

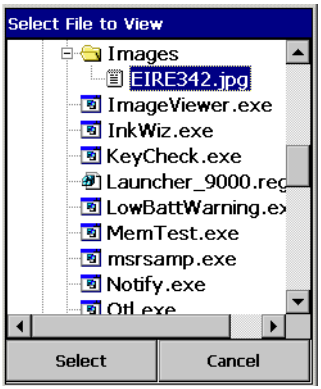


Figure 5-10. Select File to View Window

3. Double-tap the image name to display it.
4. Use the positioning, sizing and save icons to manipulate and save the image, see *Table 5-2 on page 5-15*.

Table 5-2. Images Button Descriptions

Button	Description	Button	Description
	Pan Up (panning mode), increase vertical size of image.		Pan Down (panning mode), decrease vertical size of image.
	Pan left (panning mode), decrease horizontal size of image.		Pan right (panning mode), increase horizontal size of image.
	Open an image file.		Set mode to "resize."
	Set mode to "fine panning."		Set mode to “rough panning.”
	Save the current image.		*Opens the Images About* window.
	Exit the Image Viewer application.		

PC Link

Use the *PC Link* icon as a shortcut to the device-side Active-Sync component repllog.exe. Microsoft ActiveSync, synchronizes the information on the desktop computer with the information on mobile computer. Synchronization compares the data on the mobile computer with the desktop computer and updates both computers with the most recent information.

1. From the *Series 9000 Demo* window, double-tap *PC Link* icon to start ActiveSync.

Note

ActiveSync automatically connects when the mobile computer is connected to the host computer.



Figure 5-11. Connecting to Host Computer

Copying Files

Copying a file results in separate versions of a file on the mobile computer and desktop computer. Since the files are not synchronized, changes made to one file will not affect the other.

1. Connect the mobile computer to the host computer.
2. In ActiveSync on the host computer, click **Explore**. Windows Explorer will open the Mobile Device window for the mobile computer.
3. Open a new Windows Explorer and browse to the file to be copied on the mobile computer or host computer.
4. Do one of the following:
   - To copy the file to the mobile computer, right-click the file and select *Copy*. Place the cursor in the desired folder on the mobile computer, right-click and select *Paste*.
   - To copy the file to the host computer, right-click the file and select *Copy*. Open a new Windows Explorer, browse to the desired folder on the host computer, right-click and select *Paste*.

About OTL

Use *About OTL* example application window to display the OTL software version information.

1. From the *Series 9000 Demo* window, double-tap *About OTL* icon. The *About OTL* window appears.



Figure 5-12. About OTL Window

2. Tap **OK** to return to the *Series 9000 Demo* window.

Self Test

Use *Self Test* to test the specified mobile computer functions. Table 5-3 lists the tests and the test descriptions.

1. From the *Series 9000 Demo* window, double-tap *Test Apps* icon - double-tap - *Self Test* icon. The *Self Test* window appears.

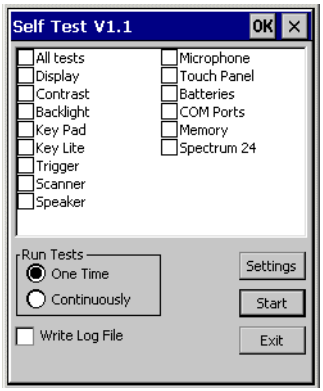


Figure 5-13. Self Test Window

Table 5-3. Self Test Descriptions

Test	Description
Display	Tests the display function.
Contrast	Tests the display contrast function. Note, properly functioning color units will return the following error massage: *Device not support contrast levels.*
Backlight	Tests the display backlight function.
Key Pad	Tests the keypad function.
Key Light	Tests the keypad backlight function.
Scan Button	Pull the scan button or press the yellow scan button to test the scan button function. Tap and hold the **Trig1 Stg1, Trig1 Stg2, Trig2 Stg1, Trig2 Stg1, Trig3 Stg1,** or **Trig3 Stg2** buttons to test the software programed scan button sequences.
Scanner	Tests the scan function.

Table 5-3. Self Test Descriptions (Continued)

Test	Description
Speaker	Tests the speaker and beeper function with sample beeps. Note, properly functioning that do not have the optional .wav file capability will return the following error message: *PlaySound(\Windows\windmin.wav) failed, error=00000000* if the Wave File **Play** button is tapped. For these units use the **Play Beeper** button to test the beeper and speaker function.
Microphone	Tests the (optional) microphone function.
Touch Panel	Provides a test box, the test box is used to test the touch panel.
Batteries	Displays a battery status window. Note, do not use the Backup Battery status display.
Com Ports	Displays a Com Ports test window.
Memory	Displays a memory status window.
Spectrum 24	Displays a S24 Test window.

2. From the *Test Applications window* (*Figure 5-1 on page 5-3*), double-tap the *Self Test* icon to enter the *Self Test* window.



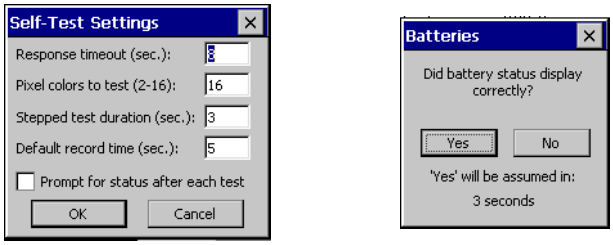
Select the One Time radio button to run each of the tests only once, or select the Continuously radio button to run the tests continuously, or until the prompt to stop running them is selected.

Select the Write Log File checkbox to save the test results to a log file. The results are saved to the Selftest.log file located in the \Temp directory. To view the test results use ActiveSync to move the file to the host computer and then can view it using a text editor. Only one test log file is saved, the next write log file test save, appends the existing Selftest.log file.

3. Tap **Settings** to display the *Self Test Settings* window. Tap **Cancel** to accept the default settings or enter new setting values and tap **OK** to accept the new settings and return to the *Self Test* window.

Note

Select the Prompt for status after each test, checkbox to display a test confirmation window after the completion of each test. The test confirmation window prompts the user to confirm if the test was successfully completed. If the Write Log File check box is also selected, a test results log file is saved that includes the user response to confirmation window prompt. Do not select this checkbox if the confirmation window is not required.



Self Test Settings Test Confirm Window

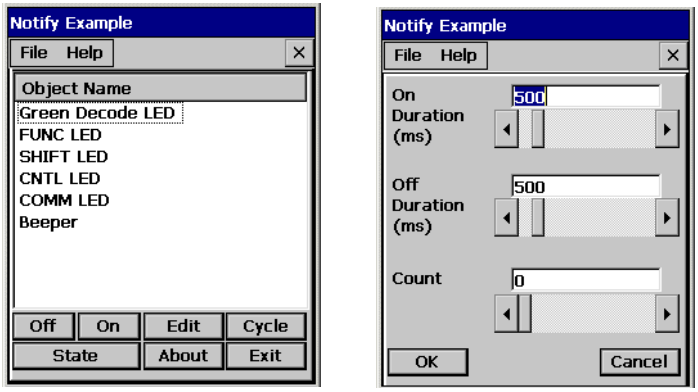
Figure 5-14. Self Test Settings Windows

4. Tap on a self test item from the *Self Test* list to select the item for testing, tap item again to de-select the item.
5. Tap **Start** in the *Self Test* window to start the self test for the selected items.
6. Follow the prompts provided for the test.
7. Tap **Exit** to return to the *Test Applications window* (*Figure 5-1 on page 5-3*).

Notify

Use *Notify to* test the mobile computer LED functions.

1. From the *Test Applications window*, double-tap the *Notify* icon. The *Notify* window appears.



Notify Window Edit Notify Parameters Window

Figure 5-15. Notify Windows

2. Tap an *Object Name* to select the item.
3. Tap **Edit** to set the parameters. Drag the slide bars to adjust the values.
4. Tap **OK** to return to the *Notify* window.
5. Repeat edit procedure, if required, for remaining items. The following *Notify* window functions are available:
   - Tap **Off** to turn off the selected item.
   - Tap **On** to turn on the selected item.
   - Tap **Cycle** to cycle the selected item on and off.
   - Tap **State** to display the selected item's state (on or off).
   - Tap **About** to view the software information.
6. Tap **Exit** in the *Notify* window to return to the *Test Applications window*.

Keyboard

Use the *Keyboard* application to test the mobile computer keypad functions.

1. From the *Test Applications window*, double-tap *Keyboard* icon. The *KeyCheck* window appears.



Figure 5-16. KeyCheck Window

2. Press any key, the corresponding value displays on the *KeyCheck* window.
3. Tap *File - Exit* to close the window.

Display

Use the *Display* window to test the mobile computer display functions.

1. From the *Test Applications window* double-tap **Display** to enter the *Display* window. The display test automatically runs through the display test windows.

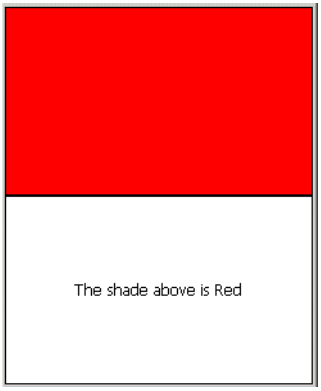


Figure 5-17. Display Test Window

Memory

Use the *Memory* application illustrates how an application should handle memory messages it receives from the Shell in the event of low memory conditions.

1. From the *Test Applications window* double-tap the *Memory* icon. The *Memory Test Window* appears.
2. The memory test automatically tests the mobile computer's memory and displays the results.

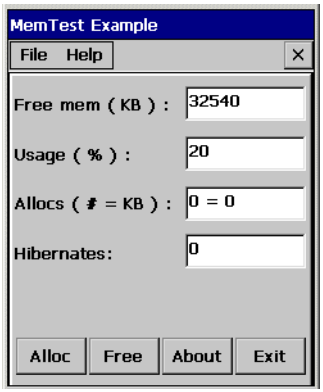


Figure 5-18. Memory Test Window

3. Tap **Alloc** to increase the amount of allocated memory and correspondingly reduce the amount of free memory.
4. Tap **Free** to increase the amount of free memory and correspondingly decrease the amount of allocated memory.

MSR9000

The *MSR9000* application is designed to work with the MSR. This sample application illustrates how an application should handle MSR inputs.

Note

The MSR must be attached to the mobile computer before the sample application is executed.

1. From the *Test Applications window*, double-tap the *MSR9000* icon. The *MSR* window appears.



Figure 5-19. MSR Window

2. Swipe a magnetic stripe card. The content on the card displays in the window.
3. If the MSR is not properly attached to the mobile computer the MSR error window appears.

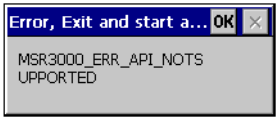


Figure 5-20. MSR Error Window

MSR Cameo

The *MSR Cameo* application is designed to work with the MSR Cameo magnetic stripe reader and printer. This sample application illustrates how an application should handle MSR inputs. See the MSR Cameo product documentation for use and setup instructions.

Note

The MSR must be attached to the mobile computer before the sample application is executed.

1. From the *Test Applications window*, double-tap the *MSR9000* icon. The *MSR* window appears.



Figure 5-21. MSR Window

2. Swipe a magnetic stripe card. The content on the card displays in the window.
3. If the MSR is not properly attached to the mobile computer the MSR error window appears.

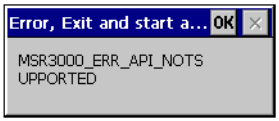


Figure 5-22. MSR Error Window

Printing

The *Printing* application illustrates how an application should handle printer outputs.

From the *Test Applications window*, double-tap the *Printer* icon. The *Printer* window appears.

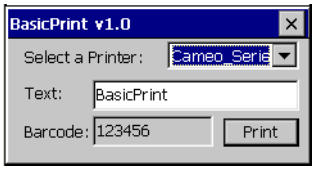


Figure 5-23. Printing Test Window

1. *From the* Select a Printer *drop-down list, select a printer.*
2. In the *Text* text box, enter text to print.
3. Tap **Print**.
4. The printer prints the contents of the *Text* text box and *Barcode* text box.

6

Spectrum24 Network Configuration

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Introduction

Wireless LANs allow the mobile computers to communicate wirelessly and to send captured data "real time" to a host device. Before a mobile computer can be used on a Spectrum24 LAN the facility must be set up with the equipment required to run the wireless LAN and the mobile computer must be properly configured. Refer to the documentation that came with the Access Points (APs) for instructions on setting up the required hardware.

The MC9000-K and MC9000-S Network Adapter settings and Spectrum24 settings configure and monitor the wireless connection. The Mobile Companion icon appears in the task tray and indicates mobile computer signal strength as follows:

Icon	Status
	Excellent signal strength
	Very good signal strength
	Good signal strength
	Fair signal strength
	Poor signal strength
	Out-of-network range (not associated)

Mobile Companion

The *Mobile Companion* utility is used to configure the mobile computer's wireless network settings. The *Mobile Companion* utility starts automatically and appears as an icon on the task tray. The status icon changes in real-time to reflect the signal strength and availability of the adapter and the wireless network. Double-tap the S24 DS Settings icon or tap the task tray Mobile Companion icon to open the Mobile Companion menu..

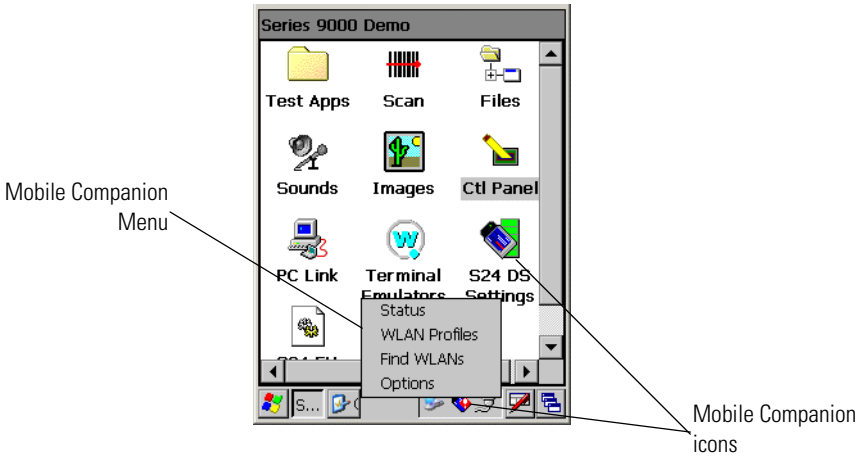


Figure 6-1. Mobile Companion Menu

When the menu opens, the user can select *Status*, *WLAN Profiles, Find WLANs*, or *Options* menu options.

Table 6-1. Mobile Companion Menu Descriptions

Menu Item	Description
Status	Displays the current status and information for the wireless connection. *Signal* tab - Displays radio signal transmission strength from the adapter (using its current profile) to the associated AP. *Info* tab - Displays Mobile Companion software, driver, firmware and hardware and country information for the current WLAN profile. *IP Status* tab - Displays network address information. *Ping* tab - Displays signal strength data, data rate and conducts data transmission tests between the mobile computer and associated AP or client. *APs* tab - Displays APs with the same ESSID as the current mobile computer profile. The mobile computer's roaming capabilities can be set from this tab. *Peers* tab - Displays the BSSIDs, power modes, transmit rates and data rates of other networked clients within the Ad Hoc (peer-to-peer) network. When in *Ad Hoc* operating mode, the *Peers* tab appears instead of the *APs* tab.
WLAN Profiles	Displays the current profiles and allows the user to add, edit and delete profiles, for more information see *Changing Profiles on page 6-26*.
Find WLANs	Displays a list of those Spectrum24 networks (APs and networked peers) available for association. The networks are listed by their ESSID. To the right of each network is a signal strength icon. Networks with a signal strength of good (three green bars out of five) or better should be considered for connection. Tap a network and tap **Connect** to interoperate with the AP representing that network. Once connected, the *Mode*, *Encryption*, *IP Config* and *power* tabs display the ESSID, security settings, network address information and power consumption level set for that network. For more information, see *Finding WLANs on page 6-6*.
Options	Displays settings for system sounds, AP and mobile computer association capabilities, profile roaming options, as well as the password protecting the Mobile Companion utility. For more information, see *Setting Options on page 6-24*.

Finding WLANs

A completed profile is a set of mobile computer configuration settings that can be used in different locations to connect to a Spectrum24 network. Creating different profiles is a good way of having pre-defined operating parameters available for use in various Spectrum24 network environments.

Select *Find WLANs* from the Mobile Companion menu to locate the APs in the area. The *Mobile Companion* window displays the available WLAN networks.

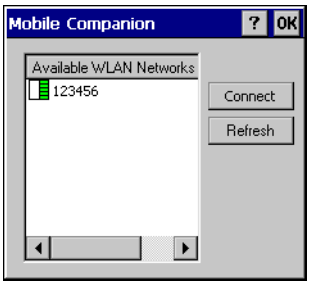
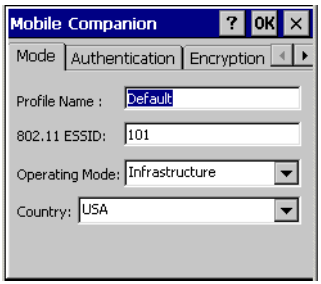


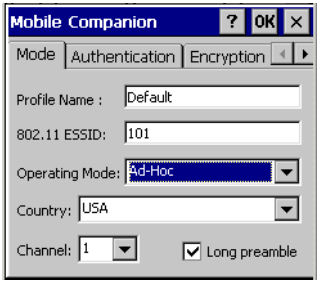
Figure 6-2. Available WLAN Networks

1. Select an available WLAN network from the list.

2. Tap **Connect**. The *Mode* tab appears.



Infrastructure Mode



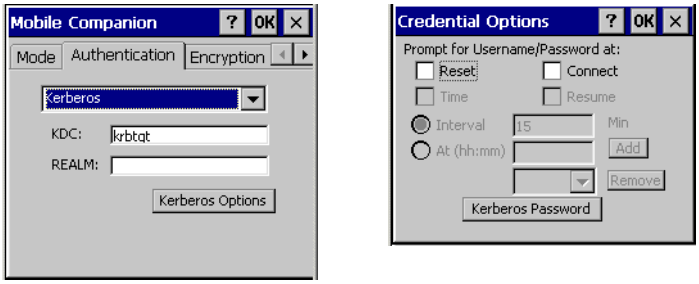
Ad Hoc Mode

Figure 6-3. Mode Tab

Table 6-2. Mode Tab Fields

Field	Description
Profile Name	Populated with the name and (WLAN) identifier of the network connection. The *Profile Name:* can bechanged. Use the *Profile Name* field to enter the name of the mobile computer profile used to transmit with either an AP or another networked computer.
802.11 ESSID	Populated with the name and (WLAN) identifier of the network connection. The ESSID is the 802.11 Extended Service Set Identifier. The ESSID is 32-character (maximum) string identifying the WLAN. The ESSID assigned to the mobile computer is required to match the AP ESSID for the mobile computer to communicate with the AP.
Operating Mode	Select the operating mode from the *Operating Mode:* drop-down list. Infrastructure: Select *Infrastructure* to enable the mobile computer to transmit and receive data with an AP. Infrastructure is the mobile computer default mode when Mobile Companion initially appears. Ad Hoc: Select *Ad Hoc* to enable the mobile computer to form its own local network where mobile computers communicate peer-to-peer without APs using a shared ESSID. Select the *Long preamble* check box if the mobile computer and its profile are using a long preamble when transmitting data. A long preamble is approximately 8 bytes of the packet header attached to the packet prior to transmission. Devices in Ad Hoc mode are required to use the same preamble length to interoperate. The mobile computer initiating the Ad Hoc network sets the channel (using the *Channel* drop-down list) used by each peer in the Ad Hoc network.
Country	Select the country of operation for the mobile computer from the *Country:* drop-down list. This ensures the mobile computer is using country code information compatible with the country code data used by the associated AP.

3. Select the *Authentication* tab to configure server-based authentication. Select one of the following Authentication options from the *Authentication* drop-down list.
   - None - Default setting when authentication is not required on the network. The client adapter does not use any authentication scheme when Open System is selected on the Encryption tab.
   - Kerberos (see Table 6-3)
   - LEAP (see Table 6-4)
   - EAP-TLS (see Table 6-5)
   - PEAP (see Table 6-6).



Kerberos Authentication

Credential Caching Settings (Kerberos Options)

Figure 6-4. Mobile Companion - Authentication Tab (Kerberos)

Table 6-3. Authentication Tab Fields - Kerberos

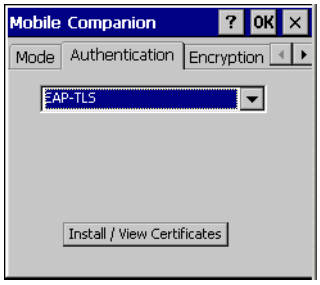
Authentication	Description
Kerberos (see Figure 6-4)	Kerberos is a different form of 128-bit data security. An adapter is required to have its request for access point resources authenticated with a Kerberos server before the server permits the access point to transmit and receive data with the associated adapter. When Kerberos is selected, the *KDC* and *Realm* entry fields appear. The *KDC* field should remain with the default KDC name (krbtgt) unless it is changed in the server. Enter the name of the server that hosts the Kerberos KDC in the *Realm* field. The KDC is located on a server and maintains information about the access points and users it supports. The KDC also permits the transmission and receipt of data once the credentials of the user are verified. Tap **Kerberos Options** to configure different caching modes for Kerberos credentials. When connecting to a Kerberos supported profile, the system can prompt for the associated user name and password at specified instances during the authentication process. Caching of credentials is optional. Kerberos Options: Select any combination of the following Kerberos Credential Caching settings: Reset: When selected, the system prompts the user for the username and password upon a warm boot. Connect: When selected, the system prompts the user for login information when the system initiates a connection to the ESSID. Time: When selected, the system requests a user name and password after the specified time parameter. Available time parameters are specified as an *Interval* (in minutes) or *At (hh:mm)* a specified time (chosen with the pull-down menu). If a time option is not selected, authentication continues without a user name and password verification. Resume: When enabled, the system prompts the user for username and password after the system is suspended and subsequently resumed. If disabled, the system prompts for a username and password only if the user's credentials are not in the registry.



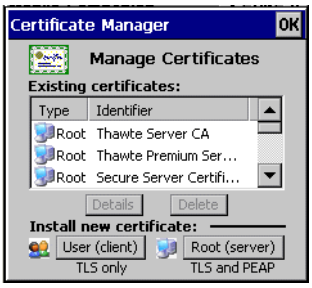
Figure 6-5. Mobile Companion - Authentication Tab (LEAP)

Table 6-4. Authentication Tab Fields - LEAP

Authentication	Description
LEAP (see Figure 6-5)	Select this option to enable LEAP authentication. LEAP is founded on mutual authentication. The AP and the mobile computer attempting to connect to it require authentication before access to the network is permitted.



EAP-TLS Authentication

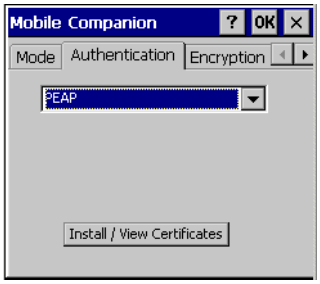


Install / View Certificates

Figure 6-6. Mobile Companion - Authentication Tab (EAP-TLS)

Table 6-5. Authentication Tab Fields - EAP/TLS and PEAP

Authentication	Description
EAP/TLS (see Figure 6-6)	EAP/TLS is an authentication scheme through IEEE 802.1x. It authenticates users and ensures only valid users can connect to the network. It also restricts unauthorized users from accessing transmitted information. EAP/TLS achieves this through secure authentication certificates.



PEAP Authentication



Install / View Certificates

Figure 6-7. Mobile Companion - Authentication Tab (PEAP)

Table 6-6. Authentication Tab Fields - EAP/TLS and PEAP

Authentication	Description
PEAP (see Figure 6-7)	Select this option to enable PEAP authentication. This method uses a digital certificate to verify and authenticate a user's identity.

1. Select the *Encryption* tab to set the adapter profile security level by configuring the encryption scheme and corresponding keys. Select an option (Open System, WEP, Keyguard-MCM, TKIP (WPA)) from the *Encryption* drop-down list. See *Table 6-7 on page 6-14* for Encryption option descriptions.

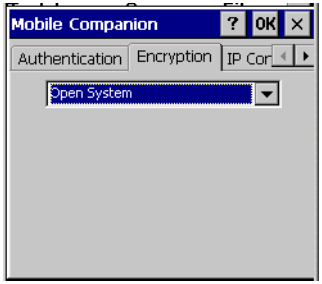


Figure 6-8. Encryption Tab

The absence of a physical connection makes wireless links vulnerable to information theft. Encryption is an efficient method of preventing data theft and improving data security.

If an AP is set to 40-bit and an adapter is set to 128-bit, the adapter can associate to the AP, but no data transmission and reception can take place.

Table 6-7. Encryption Options

Encryption	Description
Open System	Use the Open System option as the default setting when no data packet encryption is needed over the network. Selecting this option provides no security for the data being transmitted over the network. The window displays only the **OK** and **Cancel** buttons.
WEP	Select WEP for the adapter to use the WEP keys for encryption. The window displays several radio buttons and edit buttons to configure the WEP keys. Select 40-bit or 128-bit key lengths (128-bit is the default). WEP keys are manually entered in the edit boxes. Only the required number of edit boxes for a key length is displayed (10 Hex digit value for 40-bit keys, 26 Hex digit values for 128-bit keys). Use the *Key* radio buttons to configure the four WEP keys. The adapter uses the selected key. Tap **ResetKeys** to set the encryption key to the default values. Note: The default Hex digit keys are visible any time they are used. As a security precaution after setting the key values for the network, the digits are replaced with asterisks * within the Encryption key fields. If the associated access point is using an optional Passkey, the "active" adapter WLAN profile is required to use one as well. The Passkey is a plain text representation of the WEP keys displayed in the Encryption property window. The Passkey provides an easy way to enter WEP key data without having to remember the entire 40-bit (10 character) or 128-bit (26 character) Hex digit string. Tap **Passkey** to display the Passkey screen. Enter an easy-to-remember 4 to 32 character string to be used as the WEP algorithm. Click **OK**. The access point transforms the Passkey string into a set of four WEP keys using MD5 algorithms and displays them in the WEP fields. These are the new WEP keys for the adapter profile. Once displayed in the WEP key fields, the adapter profile behaves as if the keys were entered manually.
TKIP (WPA)	Select this option for the client adapter to use Wireless Protected Access (WPA) via TKIP. Manually enter the pre-shared keys in the edit boxes. Tap **ClearKey** to clear all previous keys and enter new key values. Tap **Passkey** to display the Passkey screen. Enter an easy-to-remember 8 to 63 character string.

2. Select the *IP Config* tab to configure the following mobile computer profile network address parameters: IP address, subnet, gateway, DNS and WINS. Changes made within the *IP Config* tab only impact the profile selected in the *Mode* tab and do not impact the network address parameters configured for other profiles.

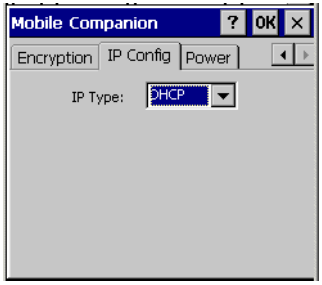


Figure 6-9. Mobile Companion - IP Config Tab (DHCP)

- Select Dynamic Host Configuration Protocol (*DHCP*) from the *IP Type* drop down list to obtain a leased IP address and network configuration information from a DHCP server. DHCP is the default setting for the mobile computer profile. When DHCP is selected, the IP address fields are read-only.

- Select Static to manually assign the IP, subnet mask, default gateway, DNS and WINS addresses used by the mobile computer profile.

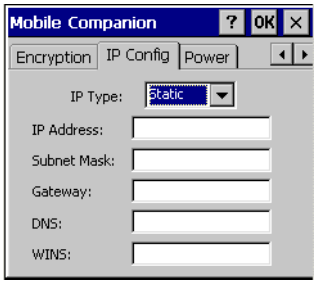
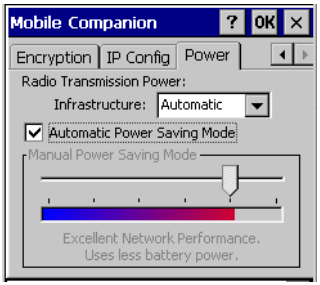


Figure 6-10. Mobile Companion - IP Config Tab (Static)

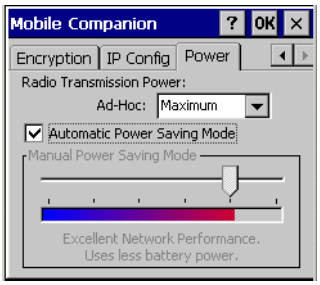
Table 6-8. IP Config Tab Fields

Field	Description
IP Address	The Internet is a collection of networks with users that communicate with each other. Each communication carries the address of the source and destination networks and the particular machine within the network associated with the user or host computer at each end. This address is called the IP address (Internet Protocol address). Each node on the IP network must be assigned a unique IP address that is made up of a network identifier and a host identifier. Enter the IP address as a dotted-decimal notation with the decimal value of each octet separated by a period, for example, 192.168.7.27.
Subnet Mask	Most TCP/IP networks use subnets in order to effectively manage routed IP addresses. Having an organization's network divided into subnets allows it to be connected to the Internet with a single shared network address, for example, 255.255.255.0.
Gateway	The default gateway is a device that is used to forward IP packets to and from a remote destination.
DNS	The Domain Name System (DNS) is a distributed Internet directory service. DNS is used mostly to translate domain names and IP addresses. It is also used to control Internet email delivery. Most Internet service requires DNS to operate properly. If DNS is not configured, Web sites cannot be located and/or email delivery fails.
WINS	WINS is a Microsoft® Net BIOS name server. WINS eliminates the broadcasts needed to resolve computer names to IP addresses by providing a cache or database of translations.

3. Select the *Power* tab to set the *Radio Transmission Power* level and the *Power Saving Modes* for the mobile computer profile.



Infrastructure Mode



Ad Hoc Mode

Figure 6-11. Mobile Companion - Power Tab)

Adjust the *Radio Transmission Power* level to expand or confine the transmission area to with respect to other wireless devices that could be operating nearby. Reducing coverage in a high traffic area improves transmission quality by reducing the amount of noise in that coverage area.

Table 6-9. Power Tab Fields

Field	Description
Radio Transmission Power	
In Infrastructure mode	There are two transmission power options: Select *Automatic* to use the AP power level. *Automatic* is the default mode for mobile computers operating in Infrastructure mode. Select *Power Plus* to set the mobile computer transmission power one level higher than the level set for the AP.
In Ad Hoc mode	There are five transmission power options: Select *Maximum* power to set the mobile computer to the highest transmission power level. Select *Maximum* power when operating in highly reflective environments and areas where other devices could be operating nearby. Additionally, use the maximum power level when attempting to communicate with devices at the outer edge of a coverage area. Select *50%*, *25%* or *10%* to set the transmit power level to that percentage of the maximum power level. Select *Minimum* power to set the mobile computer to the lowest transmission power level. Use the minimum power level when communicating with other devices in very close proximity. Additionally, select minimum power in instances where little or no radio interference from other devices is anticipated.

Table 6-9. Power Tab Fields (Continued)

Field	Description
Automatic Power Saving Mode	Switches to *Best Network Performance* when an AC power supply is detected. If a battery is used, an appropriate setting between *Best Network Performance* and *Acceptable Network Performance* is automatically chosen based on a real-time analysis of network usage. The *Automatic Power Saving Mode* is the default setting and extends the operating time before the battery is recharged.
Manual Power Saving Mode	Use to select a performance level suited to intended operation. There are six settings ranging from the *Best Network Performance* (using the most battery power) to *Acceptable Network Performance* (using the least battery power). A network performance description is displayed for each power range.

4. Tap **OK** to implement power consumption changes for the mobile computer profile.

Status

To view the status of the wireless network connection, select *Status* from the Mobile Companion menu.

1. Select the *Signal* tab to display a real-time graph of the signal quality of the mobile computer to the associated AP (Infrastructure Mode only). The number of times the mobile computer has roamed to and from APs, the current data rate and the network status are displayed. Signal quality is an indicator of how clearly the adapter can hear the associated AP.

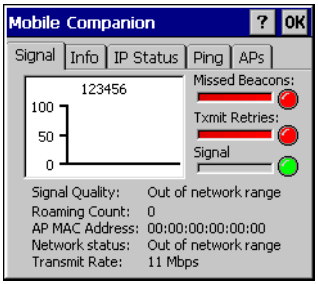


Figure 6-12. Mobile Companion - Signal Tab

Note

The Signal tab is view only and is not available if the current operating mode is Ad Hoc.

Table 6-10. Signal Fields

Field	Description
Missed Beacons	Displays the amount of beacons (uniform system packets broadcast by the AP to keep the network synchronized) missed by the mobile computer. The fewer the missed beacons the better the signal. As long as the LED to the right of the graph is green the AP association is not jeopardized by an excess of missed AP beacons. If the LED is Red, an association with a different AP could be warranted to reduce the amount of missed beacons and improve the signal.
Txmit Retries (Transmit Retries)	Displays the number of data packets retransmitted by the mobile computer. The fewer transmit retries the stronger the signal. As long as the LED to the right of the graph is green the AP association is not jeopardized. If the LED is red, an association with a different AP could be warranted to reduce the amount of transmit retries and improve the signal.

Table 6-10. Signal Fields (Continued)

Field	Description
Signal	Displays the Relative Signal Strength Indicator (RSSI) of the signal transmitted between the AP and mobile computer. As long as the LED to the right of the graph is green the AP association is not jeopardized. If the LED is red, an association with a different AP could be warranted to improve the signal.

2. Select the *Info* tab to view the mobile computer's current software and driver revision data as well as the operating parameters of the current profile.

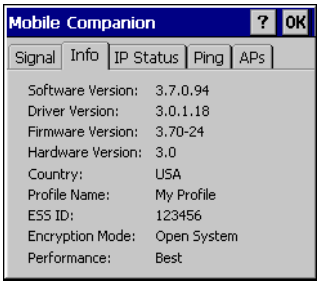


Figure 6-13. Mobile Companion - Info Tab

Note

The Version and Current Status information on this window may differ from the actual screen on the mobile computer.

Table 6-11. Info Fields

Field	Description
Version Information	Displays Mobile Companion software, driver, firmware and hardware versions as well as country information. This data is consistent for the mobile computer regardless of which mobile computer profile is the current profile.
Current Status	Displays the mobile computer's current Profile Name, ESSID and Encryption mode. Mobile computer performance is displayed using a verbal indicator of signal strength. Mobile computer operating information differs depending on which profile was enabled as the current profile.

3. Select the *IP Status* tab to view the mobile computer's network address information. Unlike the *IP Config* tab in Finding WLANs, the *IP Status* tab is view only with no user-configurable data fields.

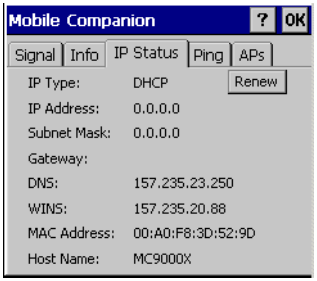


Figure 6-14. Mobile Companion - IP Status Tab

Table 6-12. IP Status Fields

Field	Description
IP Type	If DHCP was selected from the *IP Config* tab, leased IP address and network address data displays for the mobile computer. If Static was selected, the values displayed were input manually in the *IP Config* tab on page 15.
IP Address	The Internet is a collection of networks with users that communicate with each other. Each communication carries the address of the source and destination networks and the particular machine within the network associated with the user or host computer at each end. This address is called the IP address. Each node on the IP network must be assigned a unique IP address that is made up of a network identifier and a host identifier. Enter the IP address as a dotted-decimal notation with the decimal value of each octet separated by a period, for example, 192.168.7.27.
Subnet Mask	Most TCP/IP networks use subnets in order to effectively manage routed IP addresses. Having an organization's network divided into subnets allows it to be connected to the Internet with a single shared network address, for example, 255.255.255.0.
Gateway	The gateway is a device that is used to forward IP packets to and from a remote destination.
DNS	The Domain Name System (DNS) is a distributed Internet directory service. DNS is used mostly to translate domain names and IP addresses. It is also used to control Internet e-mail delivery. Most Internet service requires DNS to operate properly. If DNS is not configured, Web sites cannot be located or e-mail delivery fails.

Table 6-12. IP Status Fields (Continued)

Field	Description
WINS	WINS is a Microsoft Net BIOS name server. WINS eliminates the broadcasts needed to resolve computer names to IP addresses by providing a cache or database of translations.
MAC Address	An IEEE 48-bit address the mobile computer is assigned at the factory that uniquely identifies the adapter at the physical layer.
Host Name	Displays the name of the mobile computer.

4. Tap **Renew** to refresh the information displayed on the *IP Status* tab. The mobile device is releases the existing IP address and requests a new IP address from a DHCP server.
5. Select the *Ping* tab to send and receive ICMP ping packets across the network to the specified IP address.

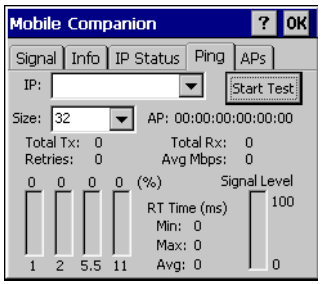


Figure 6-15. Mobile Companion - Ping Tab

6. In the *IP* drop-down list, select a target device IP address.
7. In the *Size* drop-down list, select the size of the packet transmission.
8. Tap **Start Test** to begin the ping test.
9. Tap **Stop Test** to terminate the ping test.

   The average mega-bits per second, signal strength, data rate currently in use, test statistics and round trip (RT) times are displayed for each test. The associated AP MAC address is also displayed. The signal strength level and the data transmission rate are displayed in real-time bar graphs.

10. Select the *APs* tab to view APs with the same ESSID as the mobile computer's profile.

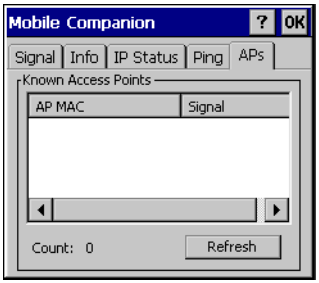


Figure 6-16. Mobile Companion - APs Tab

The associated AP displays a radio wave radiating from its antenna to indicate its associated status. Tapping the icon displays a menu with *Set Mandatory* and *Set Roaming* options.

Selecting the *Set Mandatory* item prohibits the mobile computer from associating with a different AP. The letter *M* appears on top of the icon when the *Set Mandatory* option has been selected.

Selecting *Set Roaming* allows the mobile computer to roam to any AP with a better signal. These settings are temporary and never saved to the registry.

Tap **Refresh** to update the list of the APs with the same ESSID. A signal strength value of 32 is the highest possible. The *APs* tab only appears when Infrastructure is selected as the mobile computer operating mode from the *Mode* tab.

11. If the mobile computer is in Ad Hoc mode, select the *Peers* tab to display the BSSID or MAC addresses of the other mobile computers in the network, their operating mode (PSP or CAM), their transmit rate, their supported data rate and the length of time an adapter has been out of the Ad Hoc network. Tap *Refresh* to update the *Peers* tab to the latest Ad Hoc network performance and mobile computer membership data.

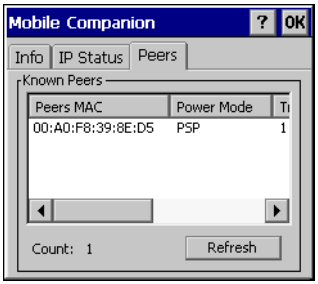


Figure 6-17. Mobile Companion - Peers Tab

Setting Options

Select *Options* from the Mobile Companion menu to:

- Access APs or Ad-Hoc networks for the Find WLAN search
- Enable or disable profile roaming
- Enable system sounds
- Enable Rogue AP Detection to check the system for unauthorized APs
- Place password protection on the current WLAN profile.

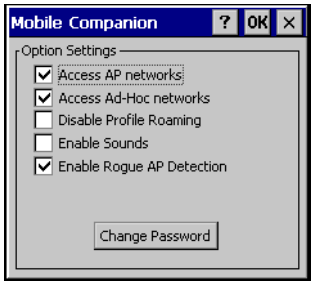


Figure 6-18. Mobile Companion - Option Settings

1. Select the *Access AP networks* checkbox to display available AP networks and their signal strength within the *Available WLAN Networks* tab. These are the APs available to the mobile computer profile for association. If this option was previously disabled, refresh the *Available WLAN Networks* tab to display the AP networks available to the mobile computer.

2. Select the *Access Ad-Hoc networks* checkbox to display available peer (adapter) networks and their signal strength within the *Available WLAN Networks* tab. These are peers available to the mobile computer profile for association. If this option was previously disabled, refresh the *Available WLAN Networks* tab to display the Ad Hoc networks available to the mobile computer.
3. Select the *Disable Profile Roaming* check box to to configure the adapter profile to not roam to another AP profile or peer profile (if in Ad Hoc mode) if a stronger signal is detected.
4. Select the *Enable Sounds* checkbox to initiate an audible signal when performing a ping test and associating with an AP. The tones are important to notify users if the pinging is received or if the mobile computer has roamed to another AP.
5. Select the *Enable Rogue AP Detection* check box to inform the system of unauthorized APs on the network.

Note

Mobile Companion has a password protection feature. When Mobile Companion initially appears, the password is off by default.

6. To create a password, tap **Change Password**.



Figure 6-19. Mobile Companion - Change Password

7. In the *Change Password* window, tap in the Current Password box and enter the current password. The password is case sensitive and a maximum of 10 characters. Enter the new password in both the New Password and the Confirm New Password boxes and tap **OK**.

Changing Profiles

Select *WLAN Profiles* from the Mobile Companion menu to view, connect to, create and edit a profile. A completed profile is a set of adapter configuration settings that can be used in different locations to connect to a wireless network. Creating different profiles is a good way of having pre-defined operating parameters available for use in various network environments. When the *WLAN Profiles* initially appears, existing profiles appear in the *WLAN Profiles* list.



Figure 6-20. Mobile Companion - WLAN Profiles

Select a profile from the list and tap **Connect** to set that profile as the active profile. The active profile displays the transmit and receive icon to the left. Once selected, the mobile computer is using the ESSID, encryption and power consumption settings initially configured for that profile.

Editing a Profile

Select a profile from the list and tap **Edit** to display the *Mode* tab where the ESSID and operating mode can be changed for the profile. Use the *Encryption*, *IP Config and Power* tabs as necessary to edit the profile power consumption and security parameters.

Creating a New Profile

Tap **New** to display the *Mode* tab, used to set the profile name and ESSID. Use the *Encryption*, *IP Config* and *Power* tabs as required to set security, network address information and power consumption level for the new profile.

Deleting a Profile

Select a profile to delete from the list and tap **Delete** to remove the selected profile.

Ordering Profiles

Select a profile from the list and tap **Move Up** or **Move Down** to order the profile. If the current profile association is lost, Mobile Companion attempts to associate with the first profile in the list and then the next until a new association is achieved.

Using LEAP for Wireless Network Security

LEAP is a security protocol that provides authentication and encryption for wireless networks. Authentication is provided through the use of user names and passwords. There are multiple options for caching of these credentials available to the administrator of the device through the registry.

There are multiple password caching options used for LEAP. The methods are:

- Save the password in the registry.
- Save the password until a warm boot (soft reset), but not saved in the registry. This method also has a timeout available.
- Never save the password, requiring a dialog box on every power-up (suspend/resume).

The default is set to cache the password until a warm boot, with no timeout. If a different password caching option is desired, the Spectrum24DS.reg registry file in the Platform folder must be re-configured.

Configuring Advanced Password Options

All password caching options are configured in the file Spectrum24DS.reg, located in the Platform folder. The file must be edited on a PC and copied back onto the device after editing is complete. The section of this file which needs editing reads "[HKEY_LOCAL_MACHINE\Comm\NETWLAN1\Parms]."

Cache the Password

To cache the password, edit the registry file using a text editor with the following changes:

1. Change the LCachePwd value from 1 to 0:

   LCachePwd = dword:0

2. Uncomment the UNAME and UPwd values (deleting the semicolons at the beginning of each line):

   UNAME = yLEAPUserName

   UPwd = myLEAPPassword

3. Change *myLEAPUserName* and *myLEAPPassword* to the correct username and password. Note that the user name and password should be in quotes. If a domain name is required, this can be entered in the user name as: *domain\username*.



A backslash is used and most setups do not require a domain name even if Microsoft Windows® NT/2000 domains are used.

4. After changing the Spectrum24DS.reg file, copy the file onto the mobile computer into the Platform using ActiveSync and overwriting the old file. Then, cold boot the mobile computer for the changes to take effect.

Cache the Password until a Warm Boot

Cache the password until a warm boot is the default setting. A timeout value can also be set in the registry. The timeout forces the user to enter the username and password after a power-on if the device had not gone through the LEAP authentication processes after the set period of time. Normally, the device goes through the LEAP authentication process at every power-up and every time it roams between APs.

The timeout setting can be set in minutes using hexadecimal in the registry file. The default setting of zero disables the timeout feature. To change the timeout setting, edit the registry file using a text editor (e.g., Notepad) as follows:

1. Ensure the "LCachePwd" value is set to dword:1.

   LCachePwd = dword:1

2. If a timeout is desired, change the LTimeoutMinutes value from 00000000 to a desired value. Examples are provided in the registry file. The following example is for 240 minutes which is represented as 000000F0 in hexadecimal.

   LTimeoutMinutes = dword:000000F0

3. Ensure that the *UNAME* and *UPwd* lines are commented out by putting a semicolon at the beginning of each line.
4. After these changes are made to the Spectrum24DS.reg file, the file must be copied onto the terminal. Copy the file into the Platform folder of the device using ActiveSync, overwriting the old file. Once this is done, cold boot the mobile computer for the changes to take effect.

Prevent Password Cache

To prevent password caching, edit the registry file using a text editor with the following changes:

1. Change the LCachePwd value from 1 to 2:

   LCachePwd=dword:2

2. Ensure that the *UNAME* and *UPwd* lines are commented out by putting a semicolon at the beginning of each line.
3. After the changes are made use ActiveSync to copy the Spectrum24DS.reg file (overwriting the old file) onto the mobile computer's Platform folder. Then cold boot the mobile computer for the changes to take effect.

LEAP Usage

After LEAP setup is complete, the only noticeable difference is the password dialog box. If the caching method selected requires a user name and password, then they appear when required. If the user name is an NT domain user, the domain can be entered in the domain field if necessary (not normally required).

Spectrum24 Frequency Hopping (FH) Settings (1 and 2 MB Radios)

Double-tap the *S24 FH Settings* icon on the *Series 9000 Demo* window to open the Symbol Spectrum24 WLAN menu.



Figure 6-21. Spectrum24 FH Settings Menus

Table 6-13. S24 FH Tab Descriptions

Tab	Description
Mobile Unit	The Mobile Unit tab configures the mobile computer ESSID, power management, RTS threshold, International Roaming capability and AP options, see *Mobile Unit Tab on page 6-31*.
MicroAP	The MicroAP tab sets the mobile computer to operate as an AP and establishes a single-cell wireless network, see *MicroAP Tab on page 6-33*.
Encryption	The Encryption tab sets the WLAN adapter to make the wireless link less vulnerable to information theft, see *Encryption Tab on page 6-34*.
WLAN Adapter	The WLAN Adapter tab sets the hardware and radio settings. The password protection feature is turned on and off from the WLAN Adapter tab, see *WLAN Adapter Tab on page 6-36*.

Mobile Unit Tab

Use the *Mobile Unit* tab to configure the mobile computer ESSID, power management, RTS threshold, International Roaming capability and AP options.

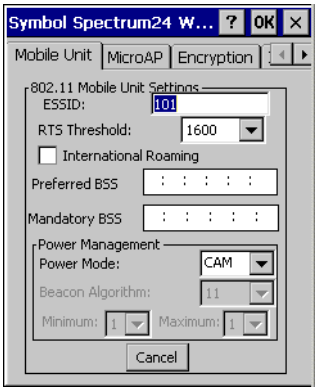


Figure 6-22. Mobile Unit Tab

Table 6-14. Mobile Unit Tab Fields

Field	Description
ESSID	Use the *ESSID* field to set the 802.11 Extended Service Set Identifier. The ESSID is a 32-character string (maximum) address identifying the wireless LAN. The ESSID assigned to the mobile computer is required to match the AP ESSID for the two devices to associate.
RTS Threshold	Use the *RTS Threshold* drop-down list to select the data transmission size at which the mobile computer alerts the AP with a Request To Send (RTS) signal prior to transmission. Once the mobile computer receives a Clear To Send (CTS) signal from the AP, the mobile computer transmits the data packet. Establishing an RTS threshold in advance of sending large volumes of data helps ensure data transmission with little interference.
International Roaming	Check the *International Roaming* check box to enable the mobile computer to associate with APs with different country codes.
Preferred BSS	Use the *Preferred BSS* field to enter the IEEE MAC address of the AP where the mobile computer prefers to associate. The mobile computer assigns a higher priority to this AP when transmitting over the network.

Table 6-14. Mobile Unit Tab Fields (Continued)

Field	Description
Mandatory BSS	Use the *Mandatory BSS* field to enter the IEEE MAC address of the AP where the mobile computer is required to associate. The mobile computer associates to only this AP when communicating on the network. Enter an AP MAC address to associate to an AP that has a compatible ESSID.
Power Mode	A Spectrum24 radio has two main power consumption modes, Continuous Aware Mode (CAM) and Power Save Poll (PSP) mode. Use the *Power Mode* drop-down list to specify the power mode to be used by the radio. CAM provides the best performance but uses the most power. CAM is the preferred mode for devices running on AC power. PSP saves significant amounts of power over CAM and is the preferred mode for devices running on battery power.

MicroAP Tab

Use the *MicroAP* tab to configure the mobile computer to operate as an AP. The MicroAP establishes a single-cell wireless network for devices in mobile unit mode.

Each MicroAP requires a unique ESSID. MicroAP cells can coexist as separate individual networks within the same site without interference. The MicroAP does not roam, but it does support roaming.

The mobile computer in MicroAP mode operates in CAM, and supports devices operating in both PSP and CAM. The MicroAP supports up to 16 mobile computers.

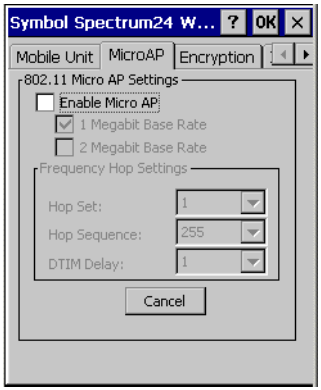


Figure 6-23. MicroAP Tab

Figure 6-24.

Table 6-15. MicroAP Tab Fields

Field	Description
Enable MicroAP	Tap the *Enable MicroAP* checkbox to support MicroAP operations. Tap the *1 or 2 Megabit Base Rate* check boxes to specify the data rate within the MicroAP cell. A MicroAP and the mobile computer are required to use the same data rate.
Frequency Hop Settings	Tap the *Frequency Hop Settings* drop-down list to establish the Hop Set, Hop Sequence and DTIM Delay to be used within the MicroAP cell.

Encryption Tab

Use the *Encryption* tab for configuring encryption settings. The absence of a physical connection makes wireless links vulnerable to information theft. Encryption is an efficient method of preventing data theft and improving data security. The firmware supports Open System and Shared Key (40-bit) Encryption algorithms.

MicroAP Authentication Options A MicroAP can use Open System, Shared Key or both. If Shared Key is enabled and Open System is not, the MicroAP grants access to adapters that have Shared Key enabled and are using the correct Encryption Key algorithm.

Adapters using Open System cannot associate to the MicroAP when the MicroAP has Shared Key enabled. Only when the MicroAP is using Open System can Open System mobile computers associate to it.



Figure 6-25. Encryption Tab

Table 6-16. Encryption Tab Fields

Field	Description
MicroAP Authentication Options	A MicroAP can use Open System Algorithm, Shared Key Algorithm or both. If Shared Key is enabled and Open System is not, the MicroAP grants access to adapters that have Shared Key enabled and are using the correct Encryption Key algorithm. Adapters using Open System cannot associate to the MicroAP when the MicroAP has Shared Key enabled. Only when the MicroAP is using Open System can Open System mobile computers associate to it.
Encryption Algorithm	Use the *Encryption Algorithm* drop-down list to select the adapter Encryption algorithm. The Open System algorithm (default setting) does not encrypt packets over the network. Select Open System to disable Encryption for the WLAN adapter and allow for the transmission and receipt of data with no security.
Shared Encryption Key	Use the Shared Encryption Key option to enable 40-bit Encryption. Select the Encryption Index key radio button (to be used for the mobile computer) and enter 10 hex digits for each key used. Tap **ok** to save and implement the encryption key data. Select an Encryption Index key radio button and tap **Reset Keys** to clear the entries in the *Shared Encryption Key* fields.

WLAN Adapter Tab

Use the *WLAN Adapter* tab to configure hardware and radio settings. Use the *Card Type: PCMCIA* to specify the antenna type and the *Radio Link Rate* radio buttons to specify the data rate supported.

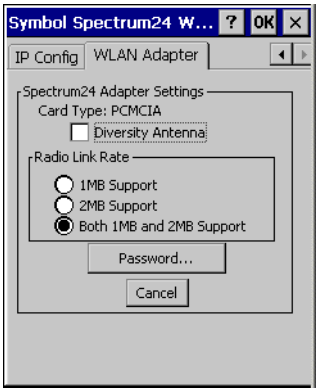


Figure 6-26. WLAN Adapter Tab

Table 6-17. WLAN Adapter Tab Fields

Field	Description
Diversity Antenna	Select *Diversity Antenna* if dual antenna support is required. Diversity improves communication in highly reflective environments. Do not select diversity if a secondary antenna is not being used. Using diversity in a single antenna application can cause poor wireless network performance.
Radio Link Rate	Use the *Radio Link Rate* radio buttons to specify the data rate supported. The mobile computer can use 1MB, 2MB or both. If *Both 1MB and 2MB Support* is selected, the mobile computer defaults to a 1 Mbps data rate if a 2 Mbps data rate cannot be established.
Password	Spectrum24 FH settings has a password protection feature that can be turned on and off from the *WLAN Adapter* tab. When the Spectrum24 FH program is initially launched, the password is off (default).

Password Protecting NCPA

NCPA has a password protection feature that can be turned on and off from the *WLAN Adapter* tab. When the NCPA program is initially launched, the password is off (default). To create a password for the NCPA advanced pages:

1. Tap **Password...** from the *WLAN Adapter* tab. The *Change Password* dialog box appears.



Figure 6-27. Change Password

2. Enter the case-sensitive password (10 characters maximum) in the *Current Password* field and tap **OK**.
3. The NCPA advanced pages dialog box is enabled and now appears when the **Advanced** button is tapped from *Easy Setup* window.
4. To disable the password dialog box, enter the current password and leave the *New Password* and *Confirm New Password* fields blank. Tap **OK**.
5. To change the password, enter the current password and enter a new password in the *New Password* and *Confirm New Password* fields.
6. Tap **OK**.

Configuring the S24 DS (11 Mb) Radio Using a Registry File

Default settings for the Spectrum24 radio card can be set on the mobile computer using registry (.reg) files. There are two registry files: Spectrum24DS.reg contains the global registry settings for Mobile Companion and S24Profiles.reg contains the profile specific and operating registry settings for Mobile Companion.

A sample S24Profiles.reg file is provided as part of the DCP for MC9000w. Edit the file using a text editor. See notes in the sample file for the key information that can be modified.

Save this text file as S24Profiles.reg. Use ActiveSync to copy this file to the *Platform* folder on the mobile computer. Once this file is loaded onto the mobile computer, these settings are restored after a cold boot.

Configuring the S24 FH (2 Mb) Radio Using a Registry File

Default settings for the Spectrum24 radio card can be set on the mobile computer using registry (.reg) files. There is one registry file (FHDOTNET.reg) that contains the global registry settings, profile specific and operating registry settings for Network Interface Card Task Tray Applet (NICTT).

A sample FHDOTNET.reg file is provided as part of the DCP for MC9000w. Edit the file using a text editor. See notes in the sample file for the key information that can be modified.

Save this text file as FHDOTNET.reg in order to override the existing reg file on the terminal. Use ActiveSync to copy this file to the Platform folder on the mobile computer. Once this file is loaded onto the mobile computer, these settings are restored after a cold boot.

7 Accessories

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Introduction

Series 9000 accessories provide a variety of product support capabilities. Accessories include cradles, keypads, Magnetic Stripe Reader (MSR) and Cable Adapter Module (CAM) snap-ons, four slot spare battery charger, headphone. Multimedia Card (MMC), Universal Battery Charger (UBC) adapter, wall mounting bracket and shelf slide.

Cradles

- Single Slot Serial/USB Cradle charges the mobile computer main battery and/or a spare battery. It also synchronizes the mobile computer with a host computer through either a serial or a USB connection.
- Four Slot Charge Only Cradle charges the mobile computer main battery.
- Four Slot Ethernet Cradle charges the mobile computer main battery and synchronizes the mobile computer with a host computer through an Ethernet connection.

Keypads

- Optional Keypads include the five interchangeable modular application specific keypads listed below. The modular keypads can be changed in the field as necessary to support specialized applications.
  - 28-key keypad (MC9000-K)
  - 43-key keypad (MC9000-K)
  - 53-key keypad (MC9000-K)
  - 28-key keypad (MC9000-S).

Miscellaneous

- Four Slot Spare Battery Charger charges up to four mobile computer spare batteries.
- Headphone can be used in noisy environments.
- The MMC provides optional secondary non-volatile storage (a SD card may also be used).
- UBC Adapter adapts the UBC for use with the MC9000 batteries.
- Wall Mounting Bracket and Shelf Slide is used for wall mounting applications.
- Short Battery Adapter, required to charge MC9000-S spare batteries in a Single Slot Serial/ USB Cradle or Four Slot Spare Battery Charger.

Snap-on Modules

There are two snap on modules:

- MSR snaps on to the mobile computer and adds magstripe read capabilities.
- CAM snaps on to the mobile computer and is used to connect the cables to the mobile computer.

Both of the snap on modules use the same cables:

- AC line cord (country-specific) and power supply, charges the mobile computer.
- Auto charge cable, charges the mobile computer using a vehicle's cigarette lighter.
- DEX cable, connects the mobile computer to a vending machine.
- Serial cable, adds serial communication capabilities.
- USB cable, adds USB communication capabilities.
- Printer cable, adds printer communication capabilities.

Keypads

The mobile computer has interchangeable modular keypads. The modular keypads can be changed in the field as necessary to support specialized applications.

CAUTION

Do not remove the keypad while the mobile computer is on and do not operate the mobile computer with the keypad detached.
Follow proper ESD precautions to avoid damaging the MMC (or SD) card. Proper ESD precautions include, but are not limited to, working on an ESD mat and ensuring that the operator is properly grounded.

Replacing the Keypad

1. Suspend the mobile computer.
2. Remove the two keypad screws. Slide the keypad down and lift up.

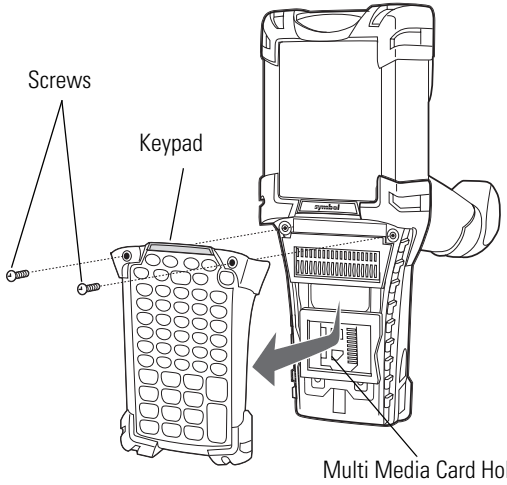


Figure 7-1. Removing the Keypad

CAUTION

Do not apply more than 4 in-lbs of torque when tightening the keypad screws.

3. Replace the keypad and re-attach using the two screws.

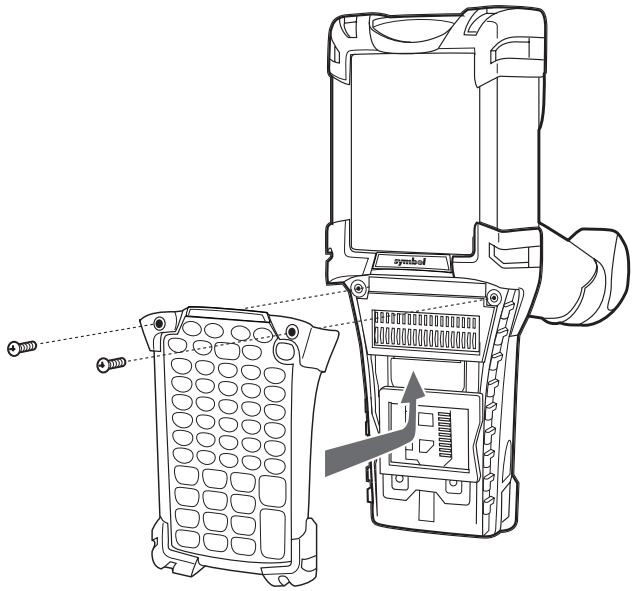


Figure 7-2. Installing the Keypad

Multi Media Card (MMC)

The MMC provides secondary non-volatile storage, however the flash memory is slower than RAM. The MMC is located under the keypad, see *Figure 7-1 on page 7-7*.

CAUTION

Do not remove the keypad while the mobile computer is on and do not operate the mobile computer with the keypad detached. Follow proper Electro-Static Discharge (ESD) precautions to avoid damaging the MMC. Proper ESD precautions include, but are not limited to, working on an ESD mat and ensuring that the operator is properly grounded.

Note

A Secure Device (SD) card may also be used, however security is not supported and only one bit is supported.

To insert the MMC:

1. Suspend the mobile computer.
2. Remove the two keypad screws and slide the keypad down and lift off (see *Figure 7-1 on page 7-7*).
3. Lift the MMC retaining door.
4. Position the MMC, with the contacts down, into the MMC holder. The MMC corner notch fits into the holder only one way. Snap the retaining door closed.

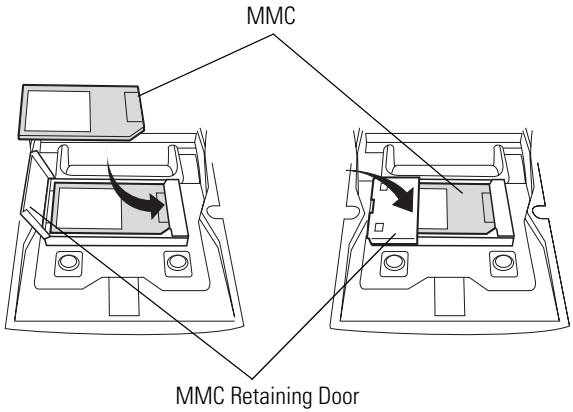


Figure 7-3. Inserting the MMC

CAUTION

Do not apply more than 4 in-lbs of torque when tightening the keypad screws.

5. Replace the keypad and re-attach using the two screws (see *Figure 7-2 on page 7-8*).

Single Slot Serial/USB Cradle

This section describes how to set up and use a CRD 9000-1000S Single Slot Serial/USB Cradle with the MC9000-K and MC9000-S. For cradle setup see Figure 7-4, for cradle communications setup procedures see, *Serial Communications Setup on page 4-10*.

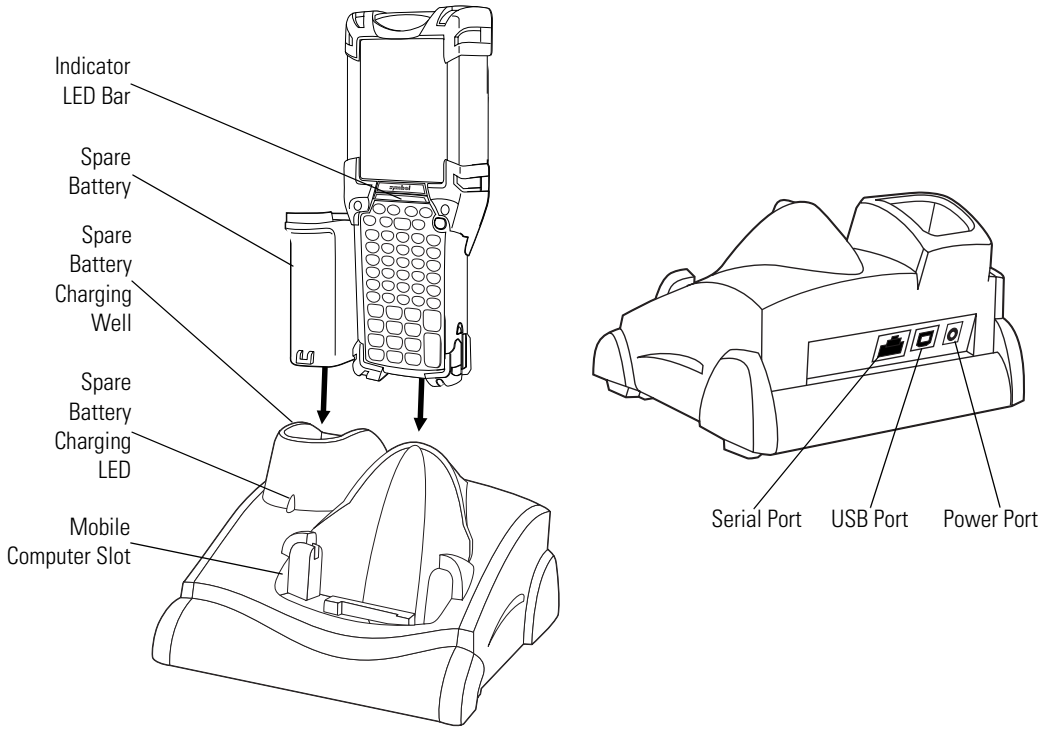


Figure 7-4. Single Slot Serial/USB Cradle

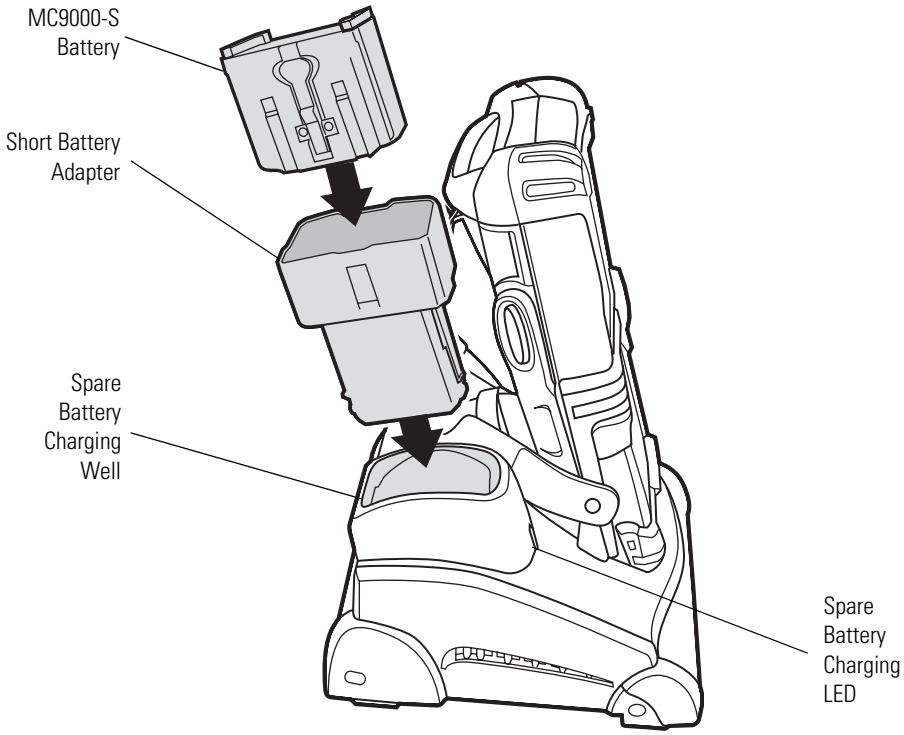


Figure 7-5. MC9000-S Spare Battery Charging

The Single Slot Serial/USB Cradle:

- Provides 15VDC power for operating the mobile computer
- Provides serial/USB ports for data communication between the mobile computer and a host computer or other serial devices (e.g., a printer)
- Synchronizes information between the mobile computer and a host computer (with customized or third party software, it can also be used to synchronize the mobile computer with corporate databases)
- Charges the mobile computer's battery
- Charges a spare battery.

Setup

Note

The cradle requires a dedicated port on the host computer.

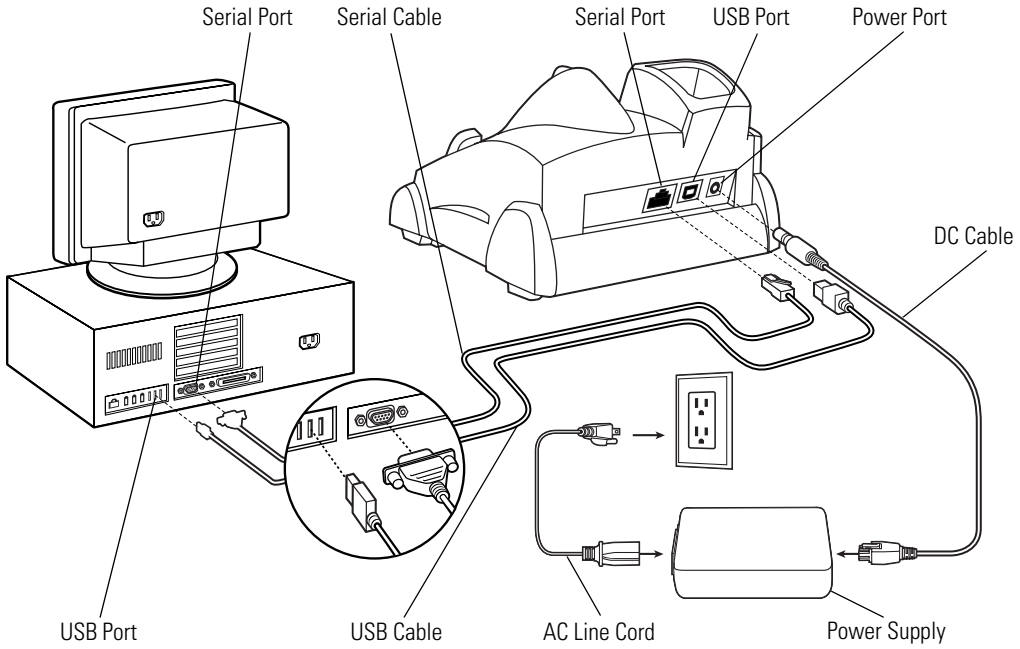


Figure 7-6. Single Slot Serial/USB Cradle, Power/Serial/USB Connections

Note

Select either serial or USB for communications, do not connect cradle to both serial and USB ports.

Battery Charging

The the single slot serial/USB cradle can charge the mobile computer's main battery and a spare battery simultaneously.

The mobile computer's amber charge LED, located in the Indicator LED Bar (see *Figure 1-1 on page 1-3*), shows the mobile computer battery charging status.

The cradle has an amber spare battery charging LED (see *Figure 7-4 on page 7-10*) that shows the spare battery charging status, see Table 7-1 for charging status indications.

The battery usually charges in less than four hours.

Table 7-1. LED Charging Status Indicators

LED	Indication
Mobile Computer Charging (LED on mobile computer)	
Off	Mobile computer not in cradle; mobile computer not placed correctly; cradle is not powered.
Fast Blinking Amber	Error in charging; check placement of mobile computer.
Slow Blinking Amber	Mobile computer is charging.
Solid Amber	Charging complete.
Spare Battery Charging (LED on cradle)	
Off	No spare battery in slot; spare battery not placed correctly; cradle is not powered.
Fast Blinking Amber	Error in charging; check placement of spare battery.
Slow Blinking Amber	Spare battery is charging.
Solid Amber	Charging complete.

Vehicle Cradle

There are two versions of the VCD9000 Vehicle Cradle, one is used with the MC9000-K mobile computer and one is used with the MC9000-S mobile computer. Both of the VCD9000 Vehicle Cradles are functionally identical. This section describes how to install and use a VCD9000 vehicle cradle with the mobile computer.

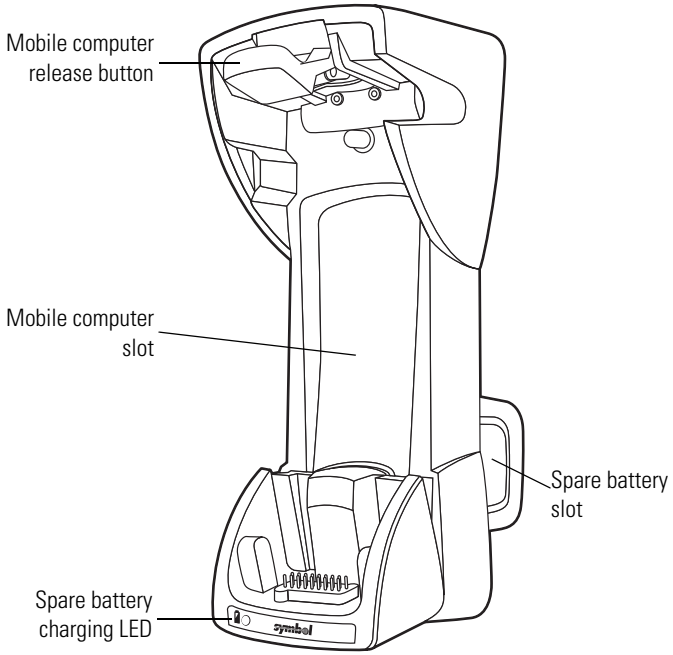


Figure 7-7. VCD9000 Vehicle Cradle - Front

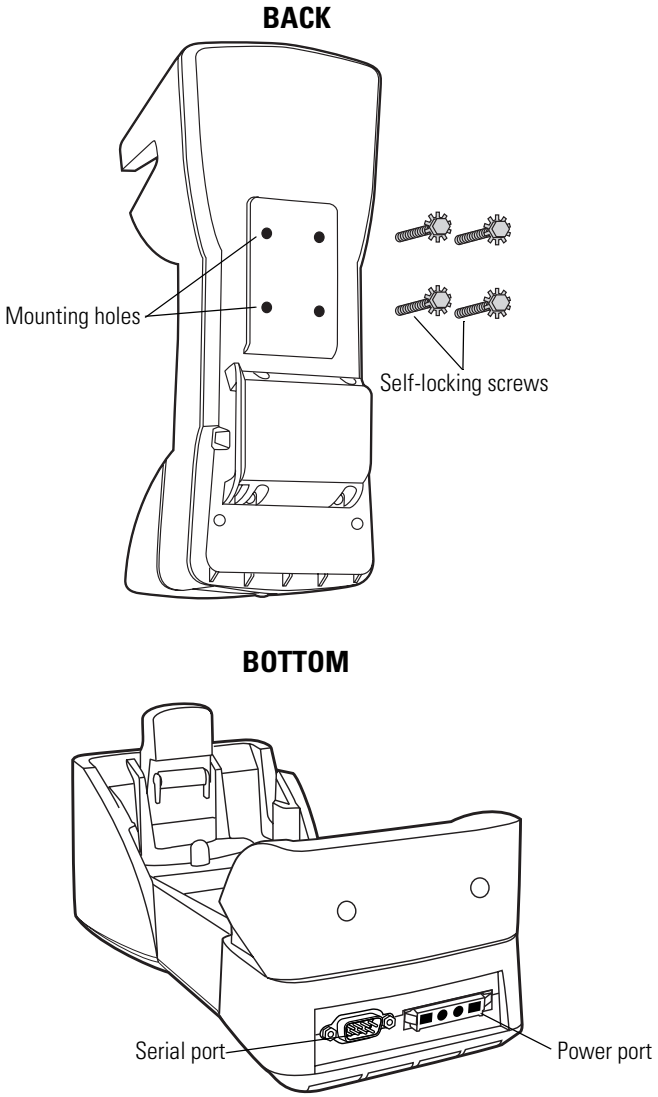


Figure 7-8. VCD9000 Vehicle Cradle - Back / Bottom

The vehicle's 12 V or 24 V electrical system powers the cradle. The operating voltage range is 9 V to 32 V and requires a maximum current of 4A. Once installed into the cab of the vehicle, the cradle holds the mobile computer securely in place. In addition, it also:

- Provides power for operating the mobile computer
- Provides a serial port for data communication between the mobile computer and an external device (e.g., a printer)
- Charges the mobile computer's battery
- Charges a spare battery.



ROAD SAFETY - Do not use the mobile computer while driving. Park the vehicle first. Ensure the mobile computer is fully inserted in the cradle. Do not place it on the seat or where it can break loose in a collision or sudden stop. Improper insertion can result in property damage or personal injury. Remember: Safety comes first.

Setup

Table 7-2 lists the requirements for setting up and using the VCD9000.

Table 7-2. VCD9000 Setup Requirements

Feature	Requirements
Mounting (See *page 7-18*)	Four 8-32 X 1" long screws with locking washers (provided as part of the cradle).
	Four #8 washers recommended.
	A drill with a #6 drill bit (0.204").
Power Connection (See *page 7-20*)  WARNING **For continued protection agains risk of fire, replace only with same type and rating of fuse according to the input voltage used.**	Power input cable (provided) connects to vehicle power.
	UL-listed in-line fuse rated 4A or 5A (both included), must be used if not connecting to vehicle's fuse panel. For 12 V operation use UL-listed 5A fuse (included). For 24 V operation use UL-listed 4A fuse (included).
	In-line fuse holder (included), must be used if not connecting to vehicle's fuse panel.
Serial Connection (See *page 7-23*)	DB9 female serial cable (some external devices require a null modem cable). The port is a Standard RS-232 for direct connection to a serial device.
Communication	An MC9000 Series mobile computer.
	Setup of mobile computer and external device (as determined by the application used).

Mounting

To mount the Vehicle Cradle without using a mounting bracket or mounting device compatible with the VCD9000:

1. Prepare the mounting surface to accept four 8-32 X 1" long self-locking screws, using a copy of the mounting template below. Drill four holes (0.204" diameter) with a #6 drill bit.

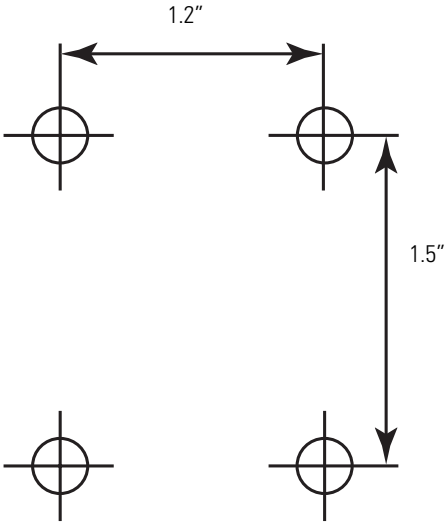


Figure 7-9. Mounting Template

2. Remove the four self-locking screws from the back of the cradle.

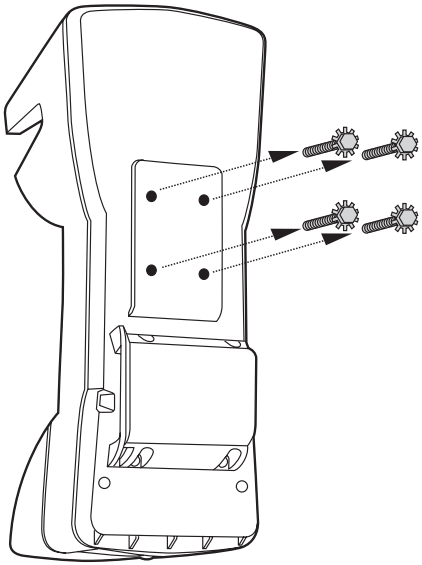


Figure 7-10. Vehicle Cradle - Back

3. Place the back of the cradle on the mounting bracket or other mounting device/surface, with the four holes in the back of the cradle aligned with the four holes in the mounting surface.
4. Insert the four self-locking screws through the holes in the mounting surface, into the back of the cradle.

Symbol recommends using #8 washers to protect the mounting surface.

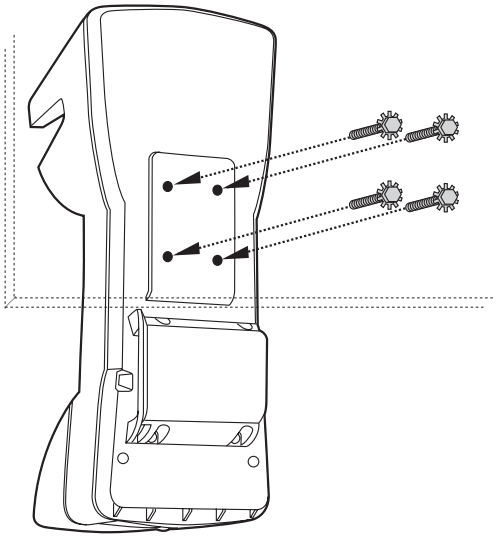


Figure 7-11. Sample Mounting Configuration



WARNING

Do not install the cradle on or near an air bag cover plate or within an aerobic zone. Also, do not install it in a location that affects vehicle safety or driving ability.

Power Connection

Read the following instructions completely before beginning.



CAUTION

A properly trained technician must perform the power connection. Improper connection can damage the vehicle or cradle.

To connect the cradle to power:

1. Locate the vehicle power source.



An accessory output in the vehicle's fuse panel is the ideal location for connecting the vehicle cradle power input cable. The vehicle cradle should be added to a circuit with a maximum load capacity for the cradle and the original circuit. Refer to the vehicle's owner's manual for identification of the circuit. If a fused output is not available, the cradle must be installed with the provided in-line fuse holder and UL-listed fuse (rated 4A for 24 V operation, 5A for 12 V operation). The fuse protects the vehicle from an electrical short on the power line to the cradle.

To use the cradle to charge the mobile computer and spare battery, shut off the vehicle's ignition, then connect the cradle to unswitched power.

2. Route the power input cable from the cradle's power port to the connection point for the vehicle's power source.



The means of routing and securing the power input cable from the cradle through to the vehicle power source is extremely important. Hazards associated with improper wiring can be severe. To avoid unintentional contact between the wire and any sharp edges, provide the cable with proper bushings and clamping where it passes through openings. If the wire is subject to sharp surfaces and excess engine vibration, the wiring harness insulation can wear away, causing a short between the bare wire and chassis. This can start a fire.

3. When using the supplied in-line fuse holder (which must be used if not connecting to the vehicle's fuse panel):
   a. Ensure the fuse holder contains a UL-listed fuse (rated 4A for 24 V operation, 5A for 12 V operation).

b. Splice the fuse holder to the end of the red V+ wire, as shown below. Make the distance from the fuse to the power connection point as short as possible.

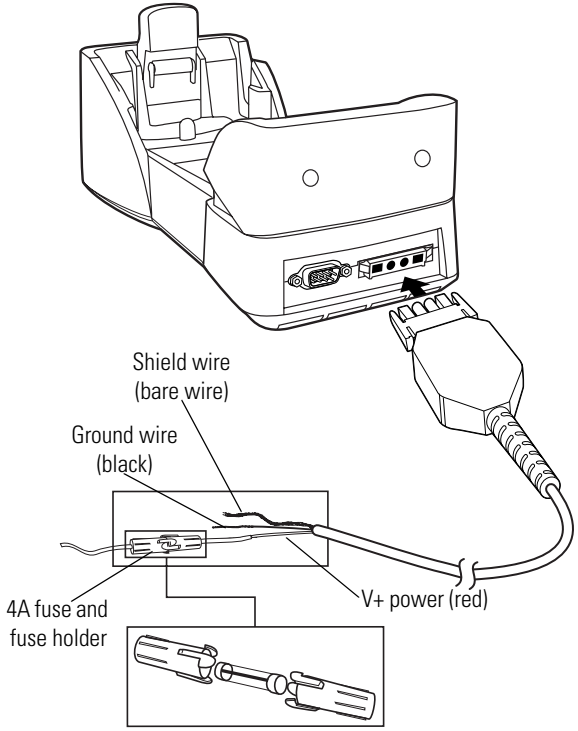


Figure 7-12. Connecting Power to Cradle

4. Prepare the cable termination.
   a. Red wire: connect to a +12/24 V vehicle power source.
   b. Black wire and shield wire: connect to vehicle ground wire or chassis ground.

Note

How the cable terminates depends on the vehicle. If the vehicle has a power output connector, attach a mating connector to the end of the power cable. You may be able to connect to a fuse panel with a simple blade terminal or commercially available connector. Consult the vehicle owner's manual for information on how to access the vehicle's power supply.

5. Connect the power input cable to the power port on the cradle.

To confirm that the cradle has power, insert the mobile computer. The mobile computer battery charging LED blinks amber to indicate charging, then turns solid amber when the battery is completely charged, see *LED Indicators on page 7-27* for other indications.

Serial Connection

When the mobile computer is inserted into the cradle, the mobile computer's serial port connects to the cradle's serial port. The mobile computer can then use the cradle's serial port to communicate with an external device.

To provide serial communication between the mobile computer and a serial device, connect one end of the 9-pin serial cable to the serial port on the cradle, and the other end to the serial port on the serial device.

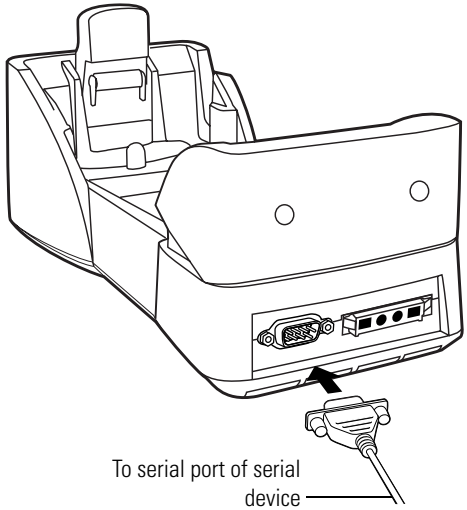


Figure 7-13. Serial Connection

Note

Some external devices may require a null modem cable.

To begin communication:

1. Insert the mobile computer into the cradle.
2. Initiate communication on the mobile computer, as determined by the application used.

CAUTION

Removing the mobile computer during communication disrupts communication between the mobile computer and the attached device.

Mobile Computer Insertion and Removal

To insert the mobile computer into the cradle, place the bottom of the mobile computer into the bottom of the cradle, then press the mobile computer back into the cradle until the release button locks it in place.

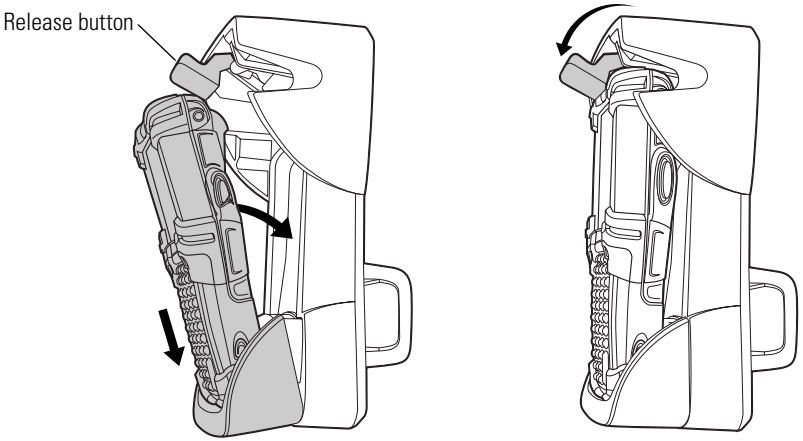


Figure 7-14. Inserting the Vehicle Cradle

WARNING

Ensure the mobile computer is fully inserted into the cradle. Improper insertion can result in property damage or personal injury. Do not use the product while driving.

To remove the mobile computer from the cradle, lift the release button, then lift the mobile computer from the cradle.

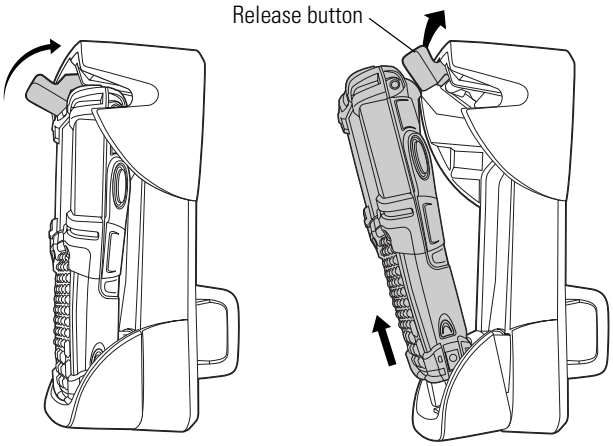


Figure 7-15. Removing the Vehicle Cradle

Mobile Computer Battery Charging

To charge the mobile computer battery:

1. Ensure the cradle is connected to a power source, see *Power Connection on page 7-20*.
2. Insert the mobile computer into the cradle, see *Mobile Computer Insertion and Removal on page 7-24*.

The mobile computer starts charging when inserted. This does not deplete the vehicle battery significantly.

The mobile computer battery charging LED blinks amber to indicate charging, then turns solid amber when the battery is completely charged. The battery charges in approximately four hours, see *LED Indicators on page 7-27* for other indications.

Spare Battery Insertion and Removal

To insert a spare battery:

1. Insert the battery into the spare battery charging slot in the back of the cradle as shown.

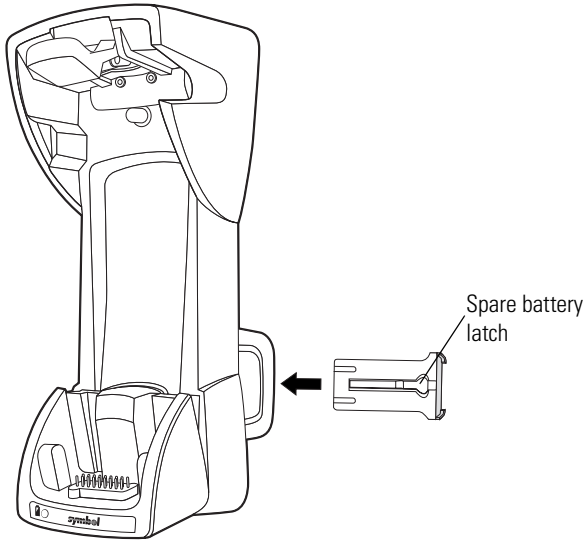


Figure 7-16. Inserting the Vehicle Cradle

2. Push the battery in. Listen for the click that signifies the battery's latch has locked the battery into place.

To remove the spare battery, press in the battery latch, then remove the battery from the spare battery slot.

Spare Battery Charging

1. Ensure the cradle is connected to a power source, see *Power Connection on page 7-20*.
2. Insert the spare battery into the cradle, see *Spare Battery Insertion and Removal on page 7-26*.

The spare battery charging LED blinks amber to indicate charging, then turns solid amber when the battery is completely charged. The battery charges in approximately four hours, see *LED Indicators on page 7-27* for other indications.

LED Indicators

Table 7-3. LED Charging Indicators

Cradle LED	Indication
Mobile Computer Battery Charging LED	
Off	Mobile computer is not in cradle; mobile computer is not inserted correctly; cradle is not powered.
Fast Blinking Amber	Error in charging; check placement of mobile computer.
Slow Blinking Amber	Mobile computer is charging.
Solid Amber	Charging complete.
Spare Battery Charging LED (on Cradle)	
Off	No spare battery in slot; spare battery is not inserted correctly; cradle is not powered.
Fast Blinking Amber	Error in charging; check placement of spare battery.
Slow Blinking Amber	Spare battery is charging.
Solid Amber	Charging is complete.

Care and Cleaning

Avoid getting oils, grease, or gasoline on the cradle, and do not let debris gather in the bottom of the cradle slot. When necessary, clean the cradle with a mild cleaner. If necessary, contact Symbol for advice on whether to use a particular cleaner.

Four Slot Ethernet Cradle

This section describes how to set up and use a Four Slot Ethernet cradle. For cradle communication setup procedures, see *Ethernet Setup on page 4-16*.

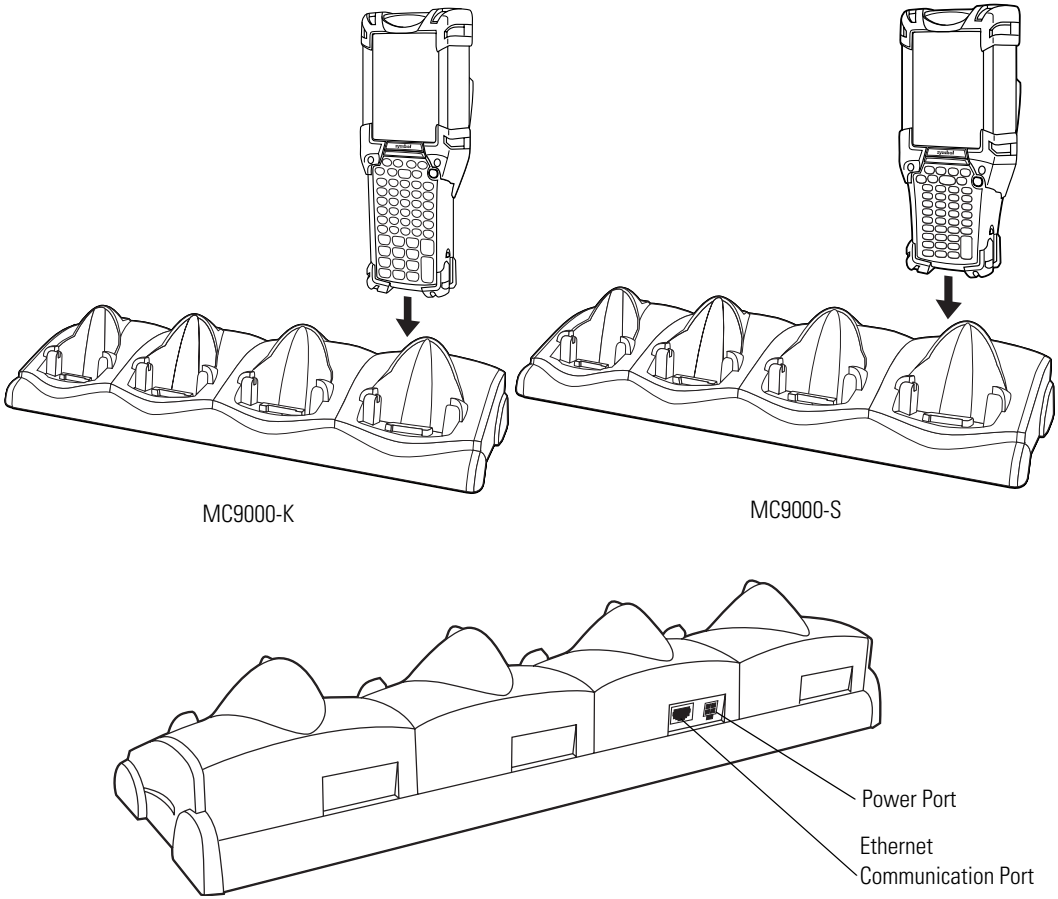


Figure 7-17. Four Slot Ethernet Cradle

The Four Slot Ethernet cradle has the following attributes:

- Provides 12VDC power for operating the mobile computer.
- Enables data communication between the mobile computer (up to four) and a host computer, over an Ethernet network (using a standard 10Base-T Ethernet cable).
- Synchronizes information between the mobile computer and a host computer. (With customized or third party software, it can also be used to synchronize the mobile computer with corporate databases.)
- Simultaneously charges up to four batteries in the mobile computer.

Setup

Note

The Ethernet cradle must be connected to a power source and to an Ethernet Hub (when applicable).

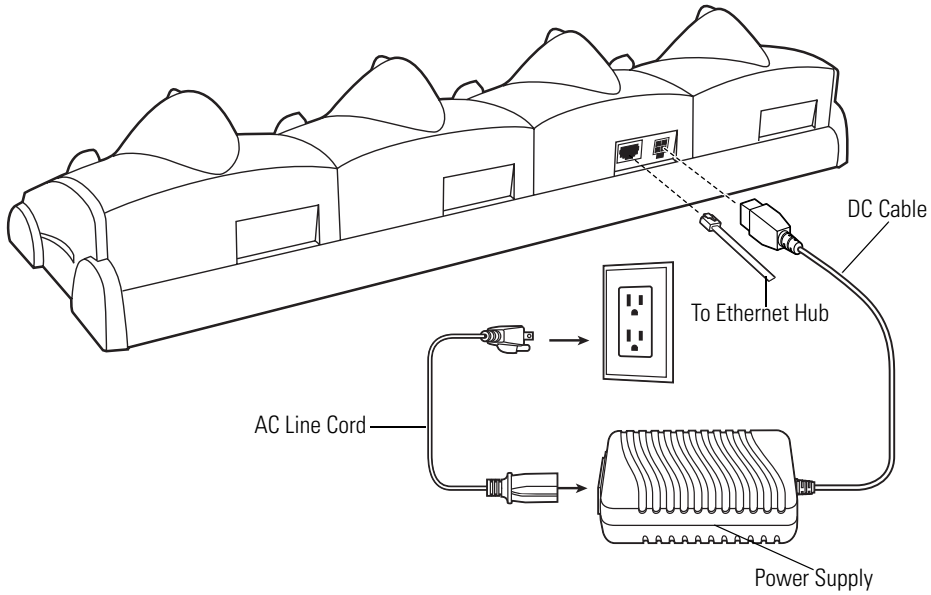


Figure 7-18. Four Slot Ethernet Cradle Power Connection

Battery Charging Indicators

The mobile computer's amber charge LED, located in the Indicator LED Bar, see *Figure 1-1 on page 1-3*, shows the battery charging status. See *Table 7-1 on page 7-13* for charging status indications.

The battery usually charges in less than four hours.

Four Slot Charge Only Cradle

This section describes how to set up and use a Four Slot Charge Only Cradle with the mobile computer.

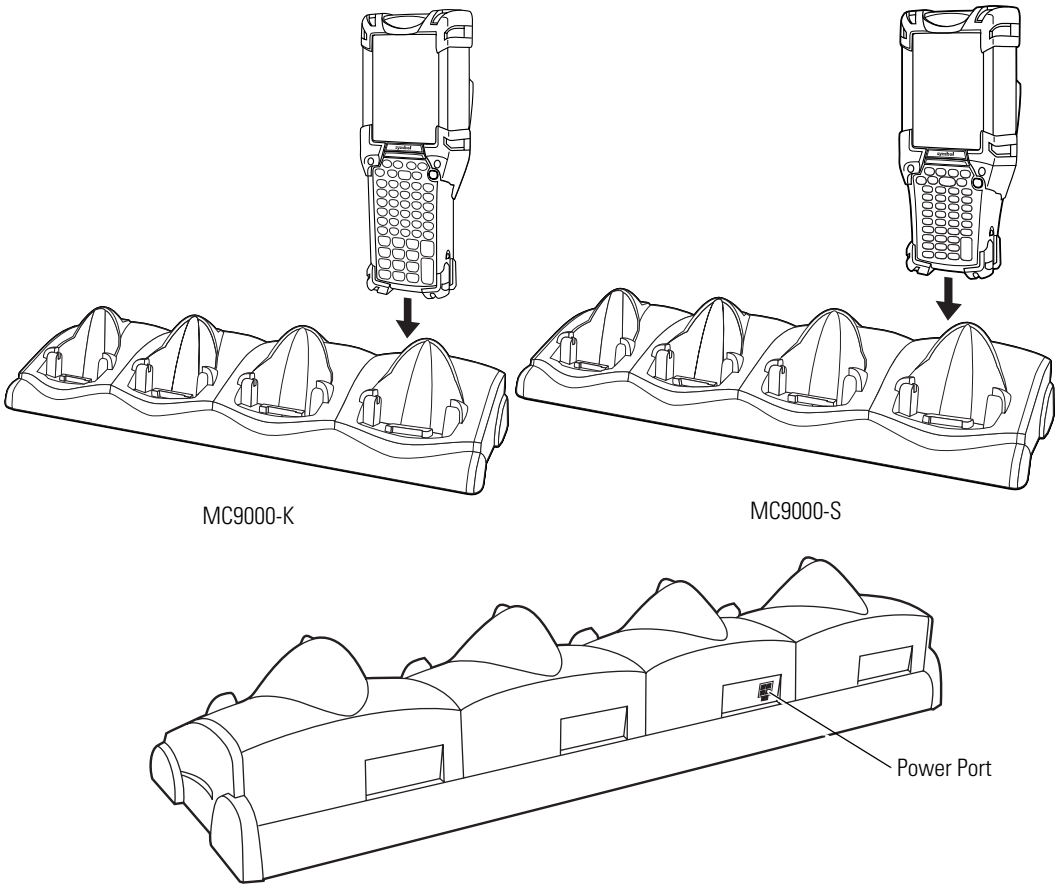


Figure 7-19. Four Slot Charge Only Cradle

The Four Slot Charge Only Cradle has the following attributes:

- Provides 12VDC power for operating the mobile computer.
- Simultaneously charges up to four batteries in the mobile computer.

Setup

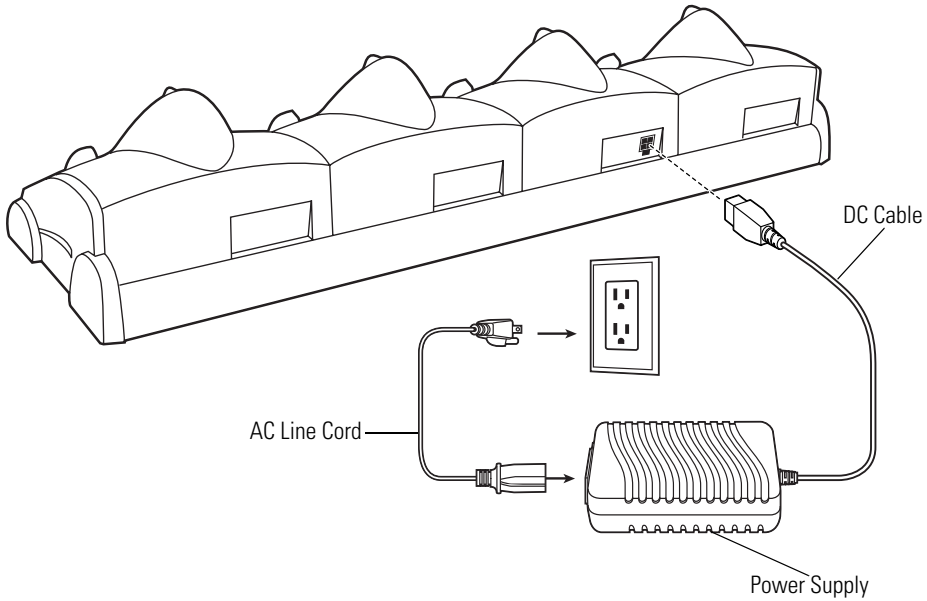


Figure 7-20. Four Slot Cradle Power Connections

Battery Charging Indicators

The mobile computer's amber charge LED, located in the Indicator LED Bar, see *Figure 1-1 on page 1-3*, shows the battery charging status. See *Table 7-1 on page 7-13* for charging status indications.

The battery usually charges in less than four hours.

Four Slot Spare Battery Charger

This section describes how to set up and use the Four Slot Spare Battery Charger to charge up to four MC9000-K or MC9000-S spare batteries.

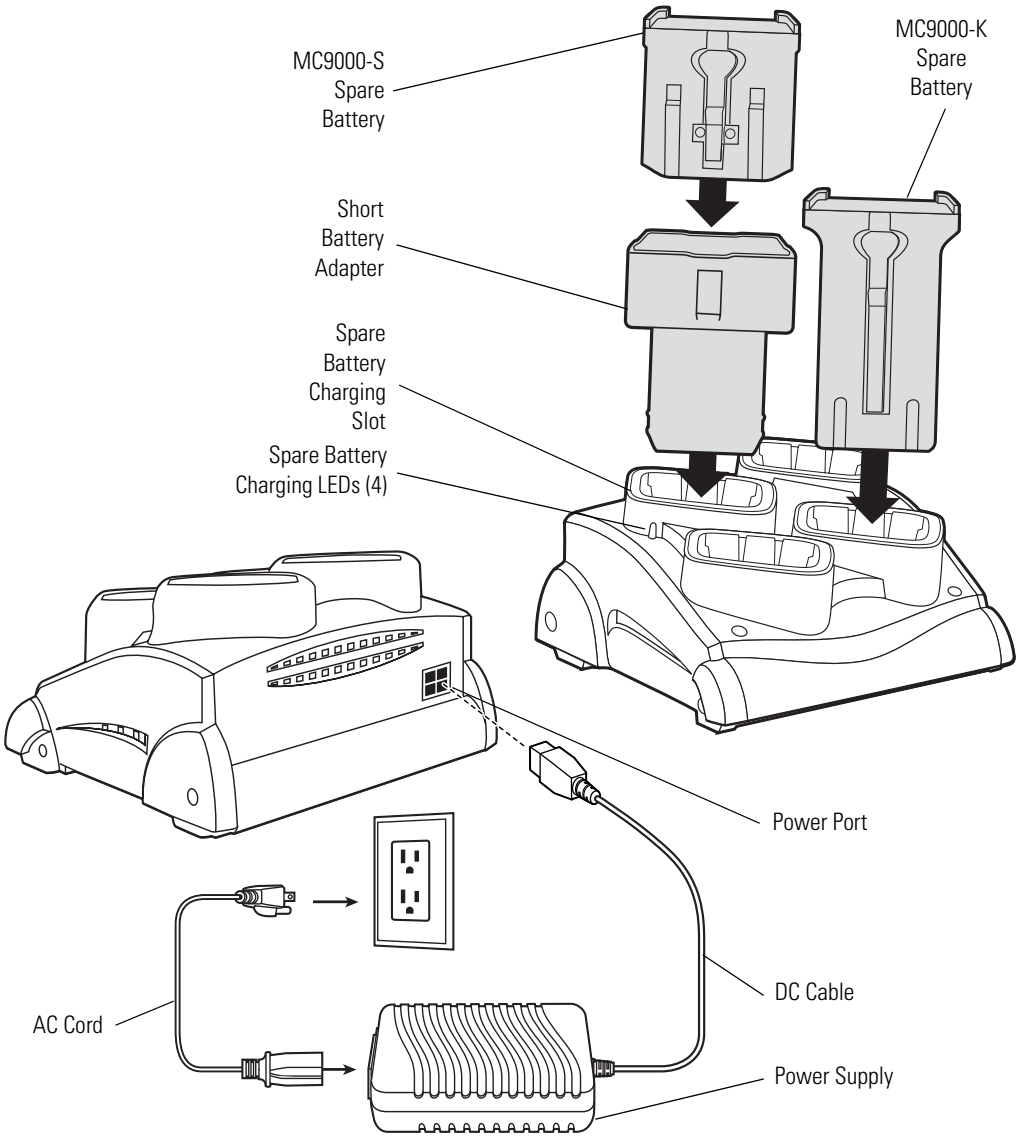


Figure 7-21. Four Slot Spare Battery Charger

Spare Battery Charging with the Four Slot Spare Battery Charger

1. Connect the charger to a power source.
2. For MC9000-K battery charging, insert the battery into a spare battery charging slot and gently press down on the battery to ensure proper contact.
3. For MC9000-S battery charging use the Short Battery Adapter, see *Figure 7-5 on page 7-11* and gently press down on the battery to ensure proper contact.

LED Charge Indications

An amber LED is provided on the Four Slot Spare Battery Charger to indicate spare battery charging status, see *Table 7-1 on page 7-13* for charging indication details.

Magnetic Stripe Reader

This section describes how to set up and use the snap-on MSR with the MC9000-K and the MC9000-S. The MSR snaps on to the mobile computer and can be removed easily when not in use.

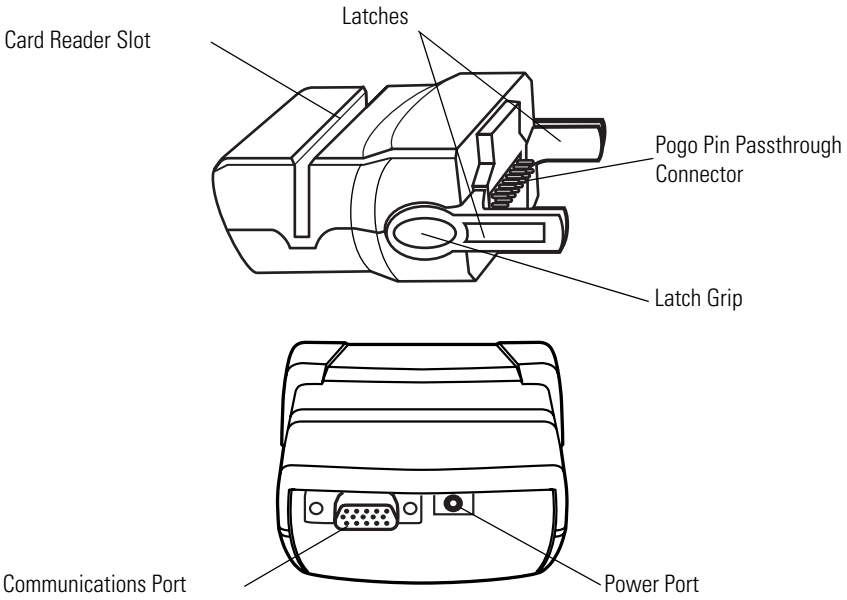


Figure 7-22. MSR

The MSR:

- Provides mobile computer's operating power and battery charging power when used with the Symbol approved power supply and cable.
- Allows the mobile computer to capture data from magnetic stripe cards. (To download MSR data capture software, visit: http://devzone.symbol.com.)
- Provides serial connection through the serial pass-through port for communication with a serial device, such as a host computer. For communication setup procedures, see *Serial Communications Setup on page 4-10*.
- Provides USB connection through the USB pass-through port for communication with a USB device, such as a host computer. For communication setup procedures, see *USB Connection Setup on page 4-13*.

MSR and CAM Installation/Removal

To attach, snap the MSR or the CAM onto the bottom of the mobile computer.

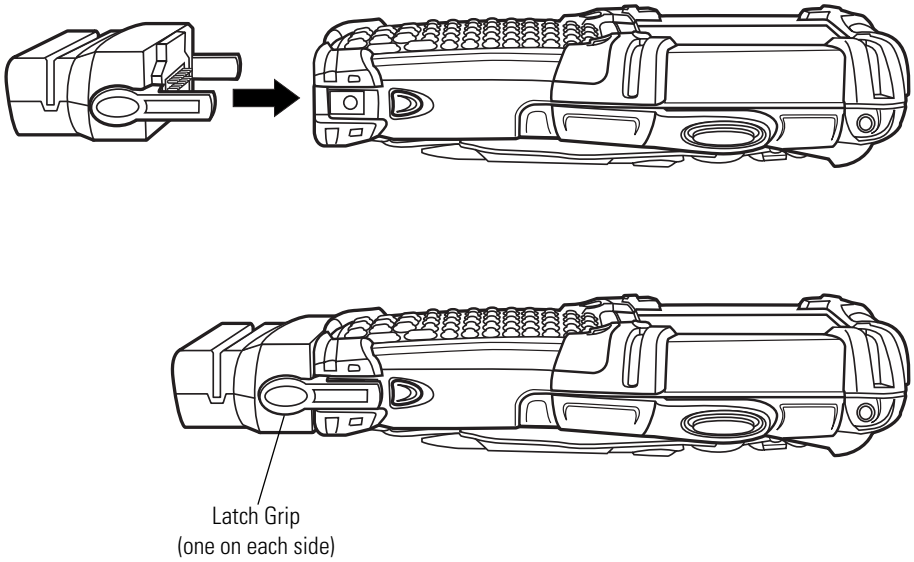


Figure 7-23. MSR and CAM Installation

To remove, squeeze the latch grips and pull the MSR or the CAM from the mobile computer.

Note

Remove the MSR from the bottom of the mobile computer before using a cradle for charging and communication.

Power Connection

The MSR or CAM can accept power from either a standard AC plug or from a 12 VDC vehicle power source:

1. Select either the universal AC power supply or the 12VDC power cable.
2. Plug the power cord into the unit.
3. Plug the other end of the power cord into the power source.

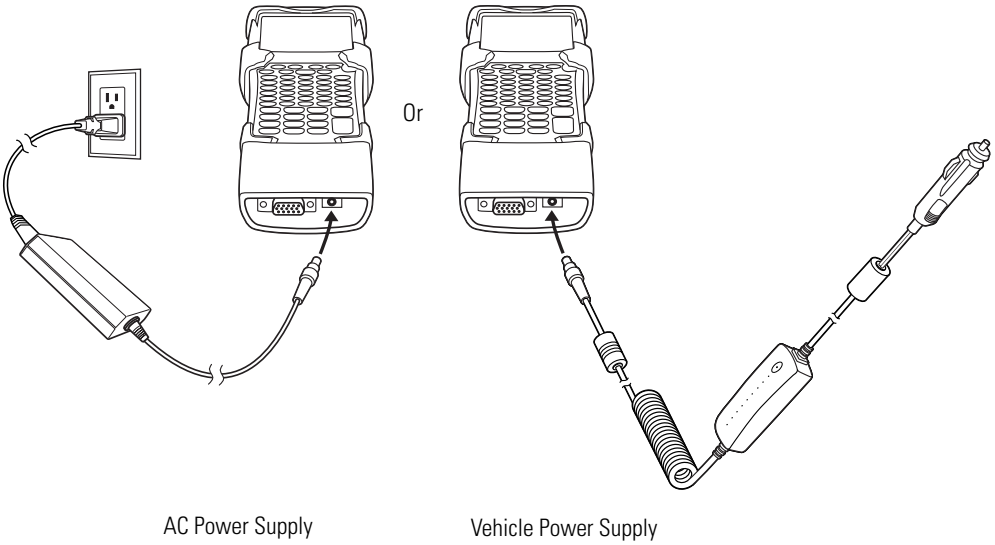


Figure 7-24. MSR or CAM Power Connection

LED Charge Indications

The mobile computer's charging LED blinks amber to indicate that the battery is charging and turns solid amber when battery is completely charged. The battery usually charges in less than four hours. See *Table 7-1 on page 7-13* for charging indication details.

Serial/USB Connection

The MSR can connect to and communicate with a serial/USB device, such as a printer or host computer, through its serial port. See *CAM and MSR Communications Setup on page 7-41* for the host computer communication setup procedure.

To connect the MSR to a serial/USB device, connect one end of the serial device cable into the communications port on the MSR and the other end into the serial/USB port on the device.

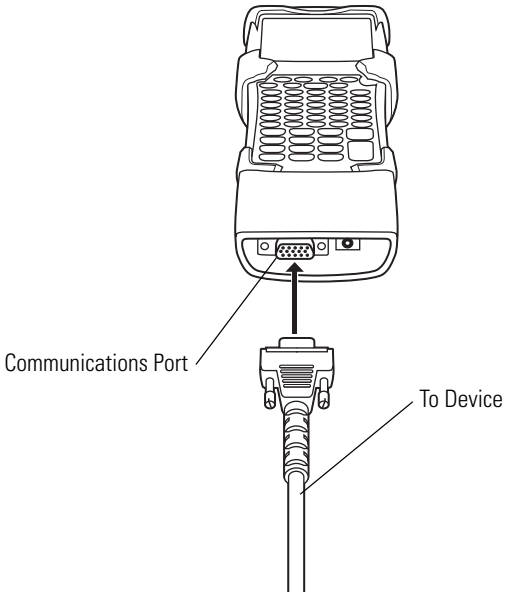


Figure 7-25. MSR or CAM Serial/USB Connection

Magnetic Stripe Reading

The *MSR9000* application is designed to work with the MSR. This sample application illustrates how an application should handle MSR inputs. From the *Test Applications window*, double-tap the *MSR9000* icon. The *MSR* window appears, see *MSR9000 on page 5-25* or *MSR Cameo on page 5-26*. The card may be swiped in either direction, from left to right or from right to left, with the magnetic stripe facing towards the mobile computer. For best results, gently press down on the card while swiping to ensure contact with the bottom of the reader.



The MSR does not need to be attached to the power supply to read magnetic stripes.

When creating software applications involving the CAM or MSR, the application developer should be aware that the devices are designed to breakaway from the terminal if accidentally dropped. The application should always check for the snap-on presence before talking to the device.

To use the MSR:

1. Attach the MSR, see *MSR and CAM Installation/Removal on page 7-35*.
2. Power on the mobile computer.
3. Tap the *MSR* or the *MSR Cameo* icon to start the application.

4. Swipe the magnetic stripe card through the reader, ensuring the magnetic stripe on the card is positioned as shown below.

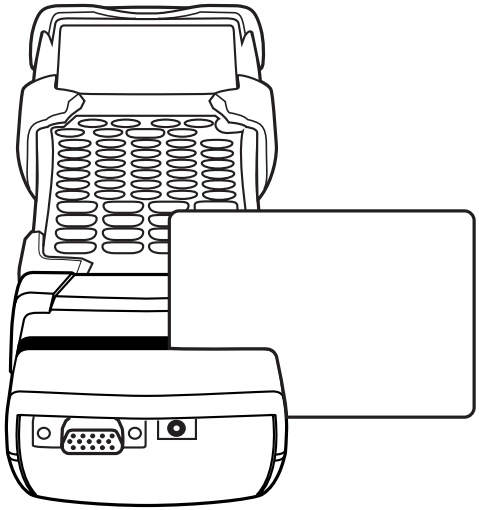


Figure 7-26. MSR Magnetic Stripe Card Swiping

Cable Adapter Module

This section describes how to set up and use the CAM. Both the CAM and the MSR attach to the mobile computer the same way, see *Figure 7-23 on page 7-35*. They also share the same power connection, see *Figure 7-24 on page 7-36* and the same serial/USB connection, see *Figure 7-25 on page 7-37*. The CAM and the MSR allow connection and charging of the MC9000-K and the MC9000-S using the following cables:

- Auto Charge Cable
- DEX Cable
- Serial Cable
- Printer Cable
- USB Cable.

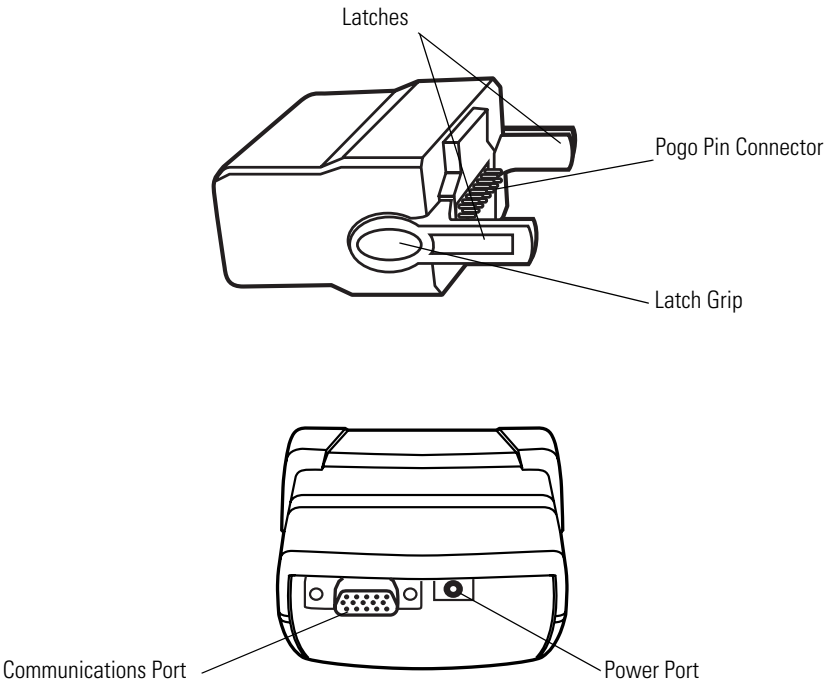


Figure 7-27. CAM

The CAM:

- Provides mobile computer's operating power and battery charging power when used with the Symbol approved power supply and cable.
- Provides serial connection through the serial pass-through port for communication with a serial device, such as a host computer. For communication setup procedures, see *Serial Communications Setup on page 4-10*.
- Provides USB connection through the USB pass-through port for communication with a USB device, such as a host computer. For communication setup procedures, see *USB Connection Setup on page 4-13*.

CAM and MSR Communications Setup

Both the CAM and MSR can be set up to communicate either with a serial connection or a USB connection and both devices use the same setup procedure. For detailed communications setup procedures, see *Communication Setup on page 4-9*.

1. On the mobile computer double-tap the *Ctl Panel* icon and double-tap *Comm Settings* to enter the *Comm Settings,* window.

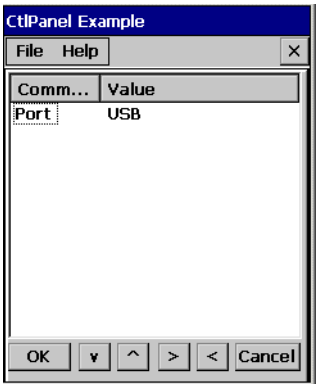


Figure 7-28. Comm Settings Window

2. With *Port* highlighted, use the left < and right arrow > buttons to select the value. Select the *Comm* port setting appropriate for the host computer, choose the default value of *USB*, or set to Serial1 @ 115200.
3. Tap **OK** to exit the *Comm Settings* window and tap **Exit** to exit the *Control Panel* window.
4. Ensure that ActiveSync was installed on the host computer and a partnership was created. See *Installing ActiveSync on page 4-3* and *Setting up a Partnership on page 4-4*.

Universal Battery Charger (UBC) Adapter

There are two UBC Adapters, one for the MC9000-K/G Batteries and one for the MC9000-S Batteries. The UBCs can be used with a power supply as a standalone spare battery charger or it can be used with the four station UBC2000 to provide charging to simultaneously charge up to four spare batteries. For additional information on the UBC 2000 see the *UBC 2000 Quick Reference Guide* 70-33188-xx.

1. Connect the power supply to the power port on the side of the UBC Adapter.

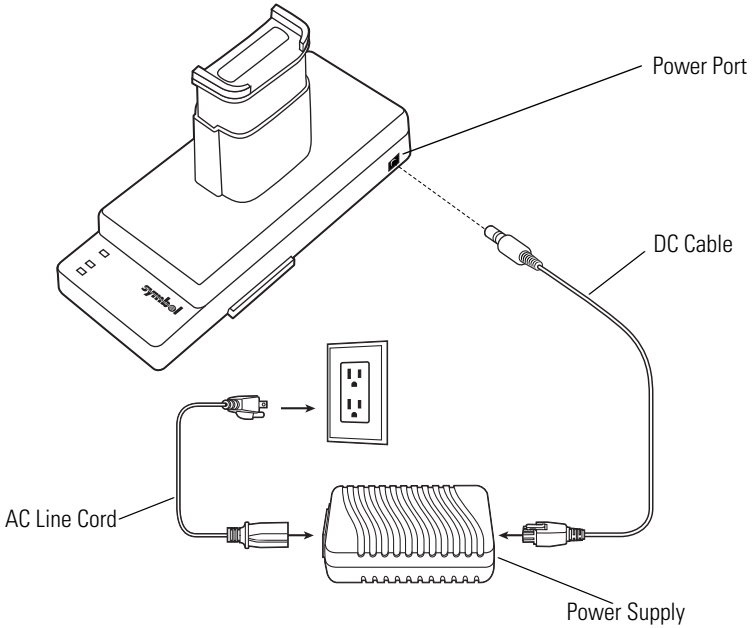


Figure 7-29. UBC Adapter Power Connection

2. Insert the battery into the battery slot with the charging contacts facing down (over charging pins) and gently press down on the battery to ensure proper contact. See Table 7-4 for the UBC Adapter LED indications.

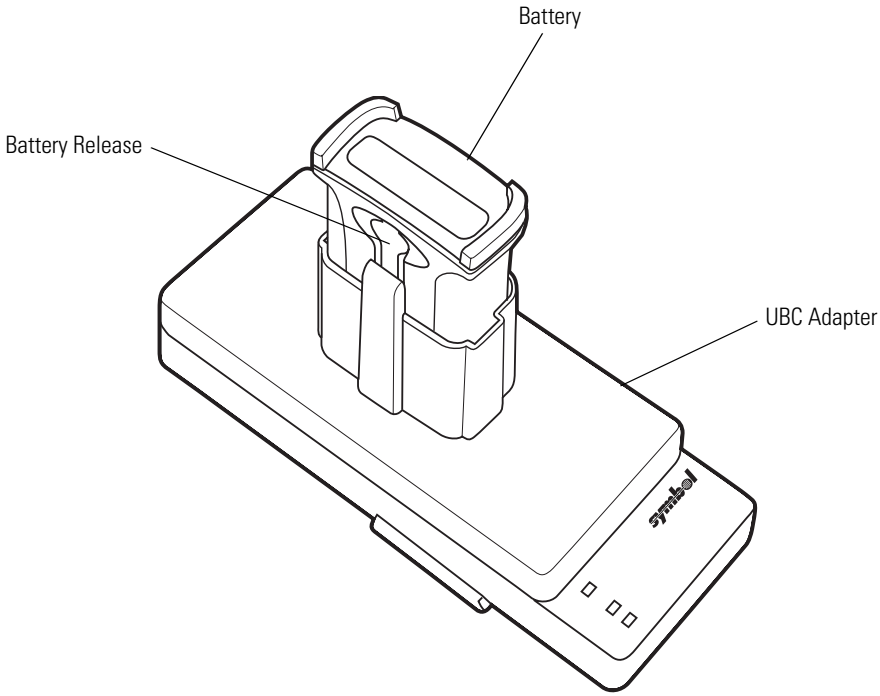


Figure 7-30. Battery Insertion

3. To remove the battery, press the battery release and lift battery out of slot.

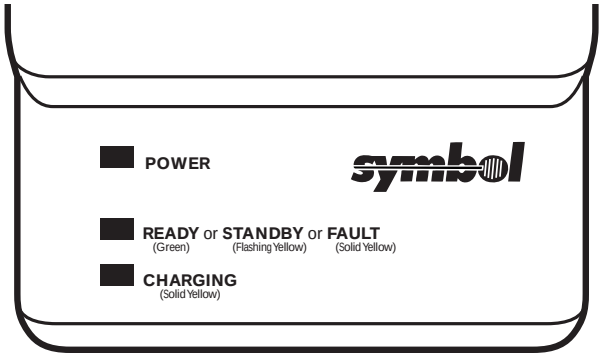


Figure 7-31. UBC Adapter LEDs

Table 7-4. UBC Adapter Charge LED Status Indications

LED	Indication	Description
POWER	Green	Power is connected to the UBC Adapter.
READY or	Green	Charging complete.
STANDBY or	Flashing-Yellow	The battery was deeply discharged and is being trickle charged to bring the voltage up to the operating level. After operating level voltage is achieved the battery charges normally.
FAULT	Yellow	Charging error, check placement of mobile computer/spare battery.
CHARGING	Yellow	Normal charge.

Modem Module

The MDM9000 Modem Module enables data communication between the MC9000 mobile computer and a host computer, remotely through the phone lines, and synchronizes information between the MC9000 and a host computer. This section describes how to setup and use the MDM9000 Modem Module.

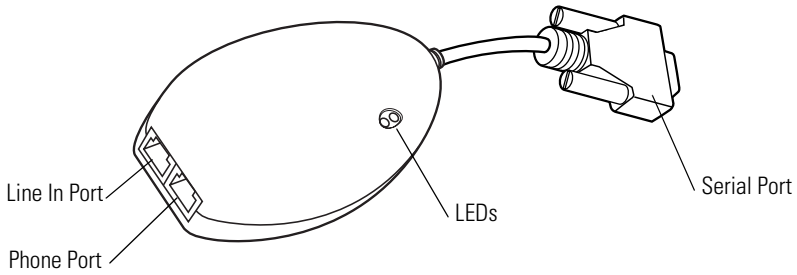


Figure 7-32. Modem Module

The Modem Module enables data communication between the mobile computer and a host computer, remotely through the phone lines, and synchronizes information between the mobile computer and a host computer.

The following items are required for a modem connection:

- Telephone number, IP address and DNS/WINS address information from the dial-in server administrator
- Dial-in account on the host system, including a user ID and password
- RJ11 or RJ12 modem cable
- Telephone jack that supports plug-in modems connected to the local telephone system
- Setup of Country Codes to use the modem with the appropriate country's telephone network.

The following items are required for communication:

- MC9000 Series mobile computer
- Cable Adapter Module (CAM), Symbol p/n ADP9000-100 (see *Cable Adapter Module on page 7-40*)
- Serial Adapter Cable (for communication via cradle), Symbol p/n 25-63856-01
- Microsoft ActiveSync
- Setup of host computer and mobile computer.

Setup

Connecting to the Mobile Computer

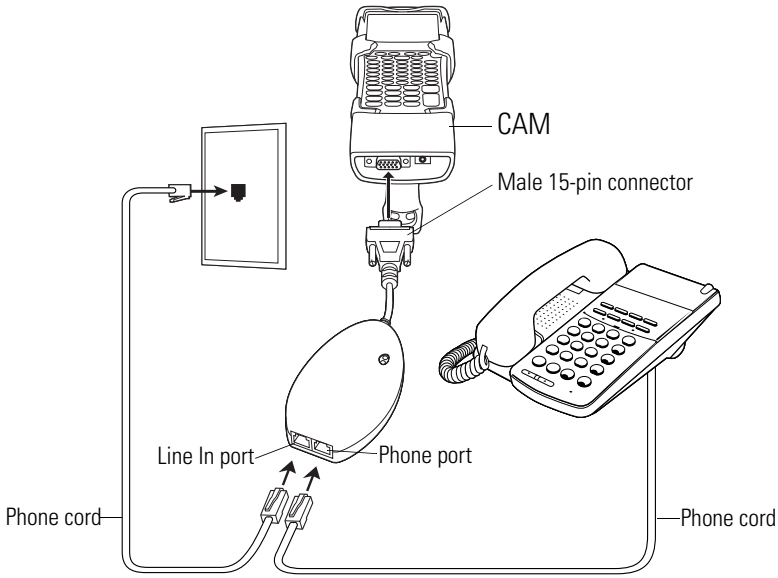


Figure 7-33. Modem Module Connection - Mobile Computer

CAUTION

Do not connect the modem's 15-pin connector into a VGA port of a host computer.

Using the Correct Telephone Line Type

Use a standard analog phone line, as in most households. In an office, use a line connected to a fax machine or modem. In a hotel, request a room with a standard phone line or data port. If necessary, check with the local phone company or administrator to make sure you are using the right type of line before sending data.

Connecting to the Single Slot Serial/USB Cradle

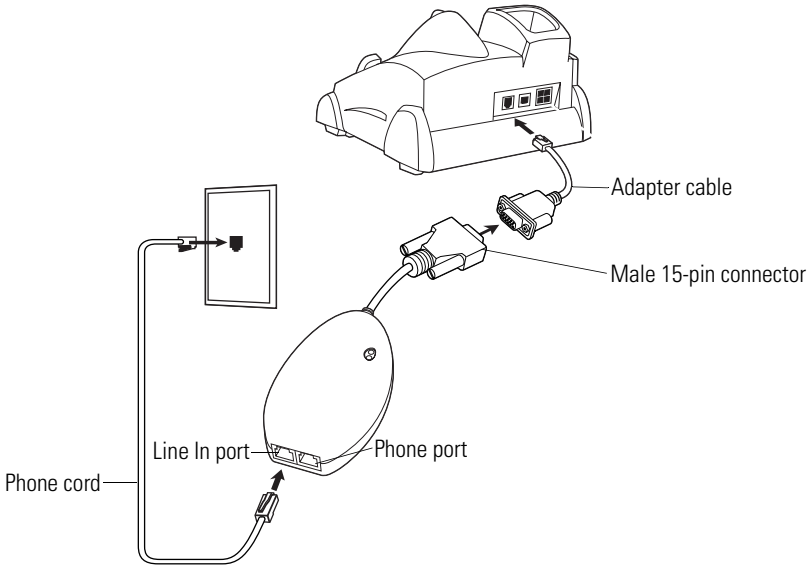


Figure 7-34. Modem Module Connection - Single Slot Serial/USB Cradle

CAUTION

Do not connect the modem's 15-pin connector into a VGA port of a host computer.

Note

If using a phone, connect the cord from the phone to the Phone port on the modem.

Configuring the Mobile Computer for the Modem

To create a modem connection on the mobile computer:

1. Connect the modem to the mobile computer, see *Connecting to the Mobile Computer on page 7-46*.
2. On the MC9000, tap *Settings* - *Control Panel*. Double-tap the *Network and Dial-up Connections* icon.

3. In the *Connection* window, double-tap *Make New Connection* to create a connection.

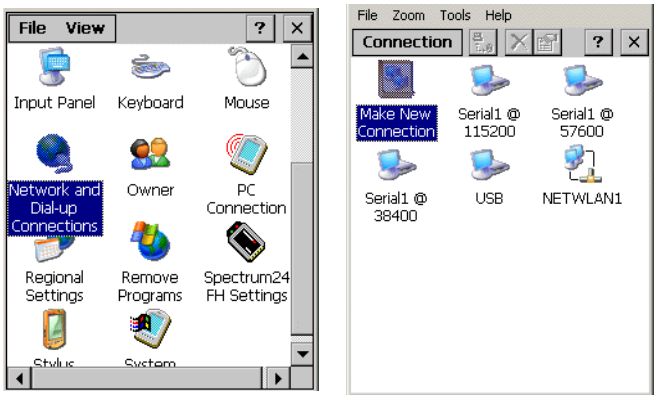


Figure 7-35. Network and Connections Windows

4. Enter a name for the connection on the *Make New Connection* window, then tap **Next**.
5. In the *Select a modem* list, select *Hayes Compatible on COM1,* then tap **Next**.

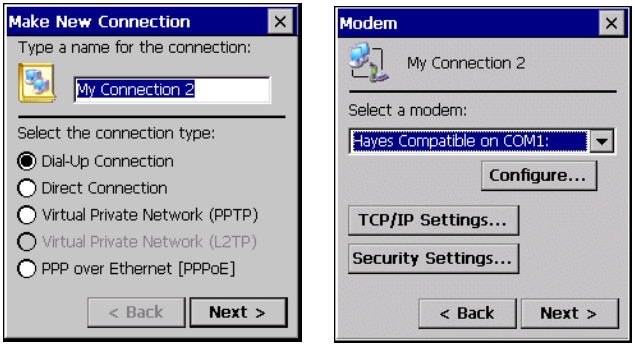


Figure 7-36. New Connection and Modem Windows

6. In the *Phone Number* window, enter the phone number for the connection, then tap **Finish**.

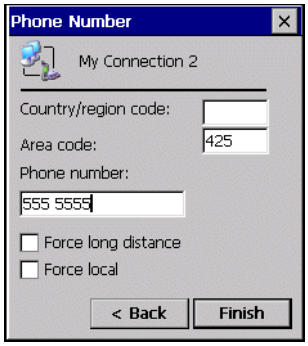


Figure 7-37. Phone Number Window

Note

Depending on the location when dialing, additional numbers may need to be dialed (e.g., a 9 prefix is often required if dialing from work; a country code is needed if dialing internationally). To avoid creating new modem connections for each situation, tap *use dialing rules* to define frequently used dialing locations.

Connecting the Modem

To connect to the host computer using the modem connection created in the last section:

1. Tap Start - Settings - Control Panel. Double-tap the Network and Dialup Connections icon.
2. In the Connection window, double-tap the name of the connection
3. created in Creating a Modem Connection on page 8.
4. To modify dial-up properties, tap Dial Properties..., make the selections in the Device Properties window, then tap OK.
5. Tap Connect. The modem attempts to connect.

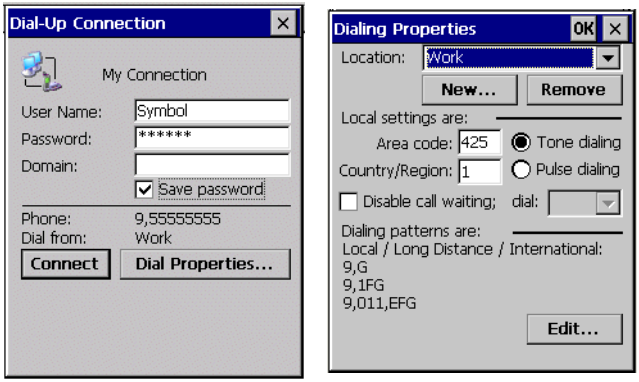


Figure 7-38. Dial-Up and Dial Properties Window

Modem Country Setup

The modem defaults to operation with US telephone networks (country code: B5). To operate the modem with other country telephone networks, enter the Country of Installation command. The modem adjusts its operating parameters to comply with the telephone network in the country specified.

Syntax

+GCI=<country_code>

Enter this command in the MC9000 when setting up comunication via modem connection.

Table 7-5. Supported Countries

Country	Code	Country	Code	Country	Code
Australia	09	Greece	FD or 46	Norway	FD or 82
Austria	FD or 0A	Iceland	FD	Portugal	FD or 8B
Belgium	FD or 0F	Ireland	FD or 57	Spain	FD or A0
Brazil	16	Italy	FD or 59	Sweden	FD or A5
Canada	20	Liechtenstein	FD	Switzerland	FD or A6
Denmark	FD or 31	Luxembourg	FD	TBR-21 (Europe)	FD

Table 7-5. Supported Countries (Continued)

Country	Code	Country	Code	Country	Code
Finland	FD or 3C	Mexico	73	United Kingdom	FD or B4
France	FD or 3D	Netherlands	FD or 7B	United States	B5 (Default)
Germany	FD or 42	New Zeland	7E		
Note: Use FD where possible. If connection problems occur, use the alternate code where provided.					

AT Commands

The AT Command Set allows you to custom-configure the modem. Only experienced users having difficulty with default settings should use this.

Changing the Initialization String

To enter AT commands:

1. On the MC9000, tap *Settings - Control Panel*. Double-tap the *Network and Dial-up Connections* icon.
2. In the *Connection* window, double-tap the *My Connection icon* to edit the settings.

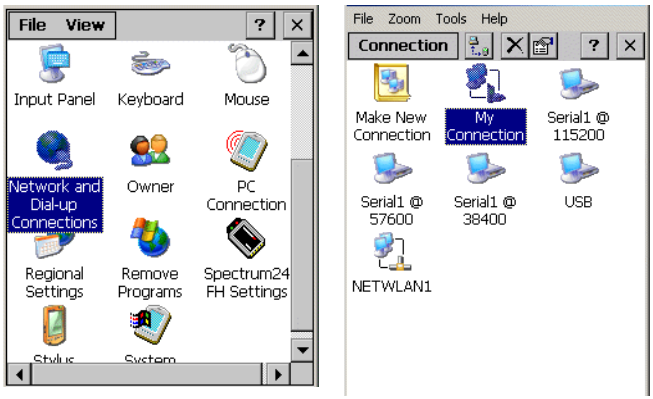


Figure 7-39. Network and Connections Windows

3. To modify dial-up properties, tap *Dial Properties*, make the selections in the *Device Properties* window.
4. To edit the *Dialing Patterns*, tap **Edit**.

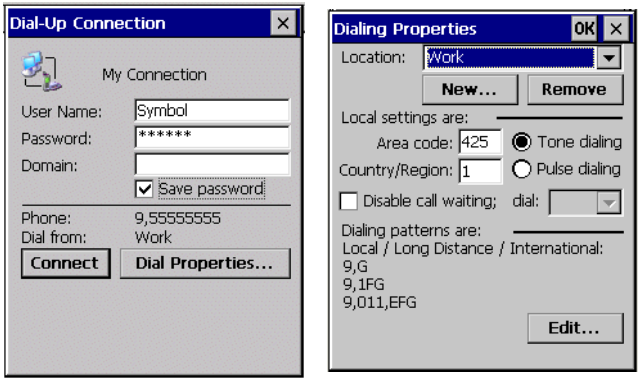


Figure 7-40. Dial-Up and Dial Properties Window

5. The *Edit Dialing Patterns* window appears.

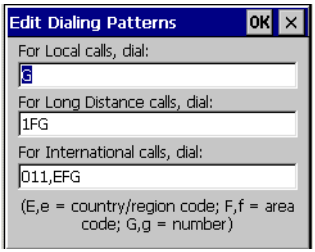


Figure 7-41. Edit Dialing Patterns Window

6. Edit the dialing properties, see *Table 7-6 on page 7-54*.
7. Tap **OK** to exit the *Edit Dialing Patterns* window.
8. Tap **OK** to exit the *Dialing Patterns* window.
9. Tap **Connect** at the Dial-Up Connection window. The modem attempts to connect.

Basic AT Command Syntax

A command line is made up of three elements:

- **Prefix** - consists of the characters "AT" or "at" or, to repeat the execution of the previous command line, "A/" or "a/".
- **Body** - made up of individual commands described later. Space characters (IA5 2/0) are ignored and may be used for formatting purposes, unless they are embedded in numeric or string constants. The termination character may not appear in the body. The modem can accept at least 40 characters in the body.
- **Termination character** - may be selected by a user option (parameter S3). The default is CR.

The format of Basic Syntax commands, except for the D and S commands, is as follows:

<command>[<number>]

where:

- <command> is either a single character, or the "&" character followed by a single character per V.250; or the "%" character followed by a single character, the "*" character followed by a single character, or the "^" character followed by a single character.
- <number> is a string of one or more characters from "0" through "9" representing a decimal integer value. Commands expecting a <number> are noted in the description of the command. If <number> is missing from such a command (<command> is immediately followed by another <command> or the termination character), the value "0" is assumed. If a command does not expect a <number> and a number is present, an error occurs. All leading "0"s in <number> are ignored by the modem.

Additional commands may follow a command (and associated parameter, if any) on the same command line with a separation character. The actions of some commands cause the rest of the command line to be ignored.

S-Parameters

Commands that begin with the letter "S" are known as "S-parameters". The number following the "S" indicates the "parameter number" referenced. If the number is not recognized as a valid parameter number, an ERROR result code issues. Immediately following this number, either a "?" or "=" character must appear. "?" is used to read the current value of the indicated S-parameter; "=" sets the S-parameter to a new value.

S<parameter_number>?

S<parameter_number>=[<value>]

If the "=" is used, the new value to be stored in the S-parameter is specified in decimal following the "=". If no value is given (i.e., the end of the command line occurs or the next command follows immediately), the S-parameter specified may be set to 0, or an ERROR result code issues and the stored value remains. The ranges of acceptable values are given in the description of each S-parameter.

If the "?" is used, the modem transmits a single line of information text to the DTE. The text portion of this information text consists of exactly three characters, giving the value of the S-parameter in decimal, with leading zeroes included.

Commands

The tables that follow summarize the AT commands, result codes, and S-Registers for the MDM 3000. **<string>** represents a letter, number, or symbol to be entered. **<value**> represents a number to be entered. Possible values are listed below the command.

Table 7-6. AT Command Table

Command	Description		Country Specific
D	Dial "D<string>"		
	0-9	DTMF digits 0-9	
	*	The 'star' digit (tone dialing only)	
	#	The 'gate' digit (tone dialing only)	
	A-D	DTMF digits A,B,C,D	X
	L	Re-dial last number	
	P	Pulse dialing	X
	T	Tone dialing	
	W	Wait for dial tone. (Modem waits for dial tone before dialing digits following "W".)	
	@	Wait for silence. (Modem waits for at least 5 seconds of silence in the call progress frequency band before continuing with next dial string parameter.)	
	&	Wait for credit card dialing tone before continuing with the dial string.	

Table 7-6. AT Command Table (Continued)

Command	Description		Country Specific
	‘	Dial pause. (Modem pauses for a time specified by S8 before dialing the digits following “,”)	
	;	Return to command state. (Modem goes off hook and allows entering additional AT commands. Use “H” to go back to on hook.)	
	() - <space>	Ignored. (Might be used to format the dial string.)	
A	**Off-hook and attempt to answer a call**		
H	**Disconnect – Hang UP**		
O	**Return to On-Line Data Mode. O <value>**		
	0	Enters on-line data mode without a retrain.	
	1	Enters on-line data mode with a retrain.	
L	**Speaker volume (Not used)**		
M	**Speaker control. M <value>**		
	0	Always off.	
	1	On during call establishment. Off when receiving carrier. (default)	
	2	Always on.	
	3	Off when receiving carrier and during dialing. On during answering.	
&G	**Guard tone. &G<value>**		X
	0	Disables guard tone. (default)	
	1	Disables guard tone.	
	2	Select 1800 Hz guard tone.	
&V1	**Displays last connection statistics**		
+MS	**Modulation Selection. +MS=<carrier>**		X
	B103	Bell 103 (300)	
	B212	Bell 212 (1200 Rx/75 or 75Rx/1200 Tx)	
	V21	300	
	V22	1200	
	V22B	2400 or 1200	

Table 7-6. AT Command Table (Continued)

Command	Description		Country Specific
	V23C	1200	
	V32	9600 or 4800	
	V32B	14400, 12000, 9600, 7200 or 4800	
	V34	33600, 31200, 28800, 26400, 2400, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400	
%E	**Enable/Disable Line Quality Monitor and Auto-Retrain or Fall back/Fall forward. %E<value>**		
	0	Disable line quality monitor and auto re-train.	
	1	Enable line quality monitor and auto re-train.	
	2	Enable line quality monitor and fallback/fall forward. (default).	
B	**CCITT or Bell. B<value>**		
	0	Select CCITT operation at 300 or 1200 bauds.	
	1	Selects Bell operation at 300 or 1200 bauds.	
&L	**Leased Line Operation. &L<value>**		
	0	Requests dial-up operation. Dial-up operation continues.	

Table 7-7. S-Register Settings

Reg	Function	Range	Default		Units
			De-fault	Saved	
S0	Rings to Auto Answer	0-255	0	*	rings
S1	Ring Counter	0-255	0	*	rings
S2	Escape Character	0-255	43		ASCII
S3	Carriage Return Character	0-127	13		ASCII
S4	Line Feed Character	0-127	10		ASCII

* Register value may be stored in on of two user

** Country-dependent

Table 7-7. S-Register Settings (Continued)

Reg	Function	Range	Default		Units
			De-fault	Saved	
S5	Backspace Character	0-255	8		ASCII
S6	Wait Time before Blind Dialing or Dial Tone	2-255	2	*	S
S7	Wait Time for Carrier, Silence or Dial Tone	1-255	50	*	S
S8	Pause Time for Dial Delay Modifier	0-255	2	*	S
S9	Carrier Detect Response Time	1-255	6	*	0.1 S
S10	Lost Carrier to Hangup Delay	1-255	14	*	0.1 S
S11	DTMF Tone Duration	50-255	95	*	mS
S12	Escape Prompt Delay (EPD)	0-255	50	*	.02 S
S14	General Bit Mapped Options Status	-	138 (8Ah)		
S16	Test Mode Bit Mapped Options Status	-	0		
S19	Reserved	-	0		
S20	Reserved	-	0		
S21	V.24 Bit Mapped Options Status	-	52 (34h)		
S22	Speaker/Results Bit Mapped Options	-	117 (75h)		
S23	General Bit Mapped Options Status	-	62 (3Dh)		
S24	Sleep Inactivity Timer	0-255	0		S
S25	Delay to DTR off	0-255	5		S
S26	RTS-to-CTS Delay	0-255	1		.01 S
S27	General Bit Mapped Options Status	-	73 (49h)		
S28	General Bit Mapped Options Status	-	0		
S29	Flash Dial Modifier Time	0-255	70		10 mS
S30	Disconnect Inactivity Timer	0-255	0		10 S
S31	General Bit Mapped Options Status	-	195 (C0h)		
S36	LAPM Failure Control	-	7	*	

* Register value may be stored in on of two user

** Country-dependent

Table 7-7. S-Register Settings (Continued)

Reg	Function	Range	Default		Units
			De-fault	Saved	
S38	Delay Before Forced Hangup	0-255	20		S
S39	Flow Control Bit Mapped Options Status	-	3		
S40	General Bit Mapped Options Status	-	104 (68h)	*	
S41	General Bit Mapped Options Status	-	195 (C3h)	*	
S46	Data Compression Control	-	138	*	
S48	V.42 Negotiation Control	-	7		
S86	Call Failure Indication	0-26	0		
S91	PSTN Transmit Attenuation Level	0-15	10**		dBm
S92	Fax Transmit Attenuation Level	0-15	10**		dBm
S95	Extended Result Codes Control		0	*	
S210	V.34 Symbol Rate	0-255	13 (0Dh)		

* Register value may be stored in on of two user

** Country-dependent

Modem LED Indicators

Table 7-8. Modem LED Indicators

LED	Indication
Off	Modem is not properly connected to the mobile computer; modem is not receiving power.
Green	Modem is connected to the mobile computer and is receiving power.
Solid Amber	Mobile computer is communicating with the host computer.

Wall Mounting Bracket and Shelf Slide

This section describes how to install and set up the MC9000 Wall Mount Bracket and Shelf Slide to mount cradles to a wall.

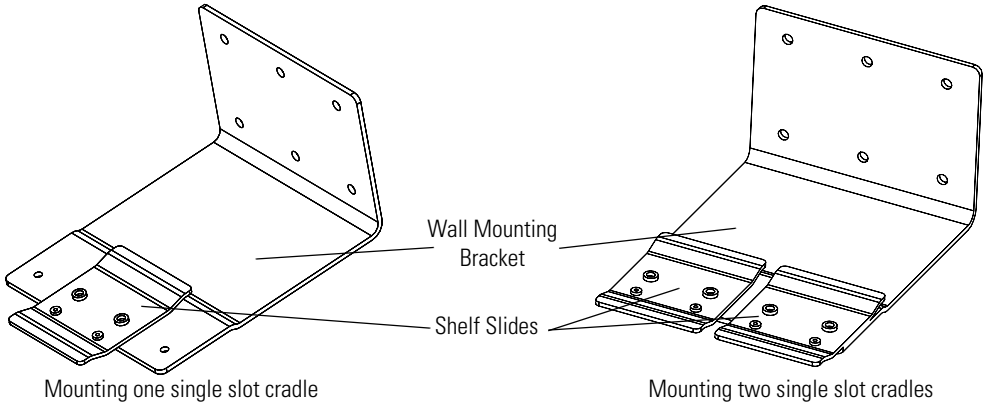


Figure 7-42. Wall Mounting Bracket with Shelf Slide

When installed on a wall, the mounting bracket and shelf slide enable mounting one or two single slot cradles to a wall. Use two brackets to mount a four slot cradle.

Installing the Wall Mount Bracket

To install the wall mount bracket for use with one or two single slot cradles or four slot chargers, place the smaller surface of the bracket against the wall or vertical support structure, and secure with four 1/4" screws (use two of the three screw holes in each row).

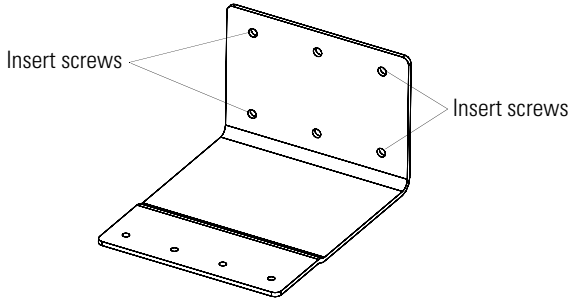


Figure 7-43. Wall Mounting Bracket Mounting Screws

If using the bracket and slide with a four slot cradle, secure a second bracket to the wall next to the first, aligning the horizontal screw holes on the second with those of the first.

Attaching the Shelf Slide to the Wall Mount Bracket

One Single Slot Cradle/Four Slot Battery Charger

To attach the shelf slide to the wall mount bracket for use with one single slot cradle or four slot battery charger:

1. Place the slide on the bracket, aligning the larger pan-head screw holes in the slide with the center two screw holes on the bracket.
2. Secure the slide to the bracket by inserting the two pan-head screws provided from below the bracket, up through the bracket's screw holes and then through the slide's pan-head screw holes.

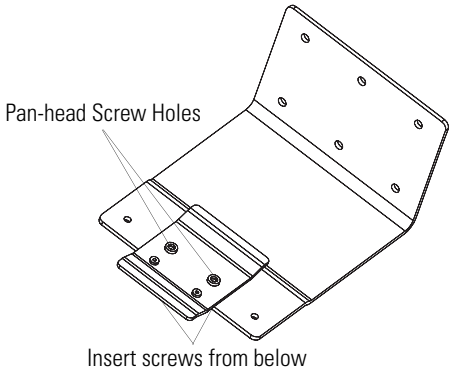


Figure 7-44. Attaching One Shelf Slide

Two Single Slot Cradles/Four Slot Battery Chargers

To attach the shelf slide to the wall mount bracket for use with two single slot cradles or two four slot battery chargers:

1. Place the slide on the bracket, aligning the larger pan-head screw holes in the slide with the left or right two screw holes on the bracket.
2. Secure the slide to the bracket by inserting the two pan-head screws provided from below the bracket, up through the bracket's screw holes and then through the slide's pan-head screw holes.
3. Secure a second slide to the remaining two screw holes on the bracket in the same manner.

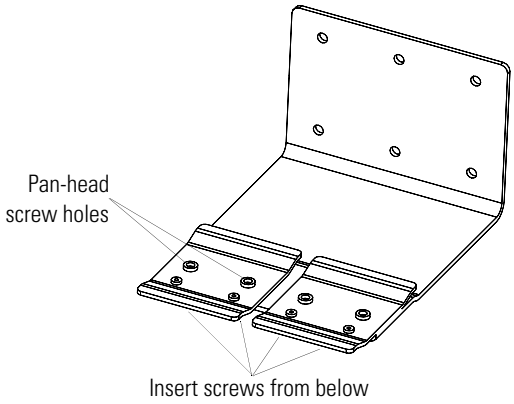


Figure 7-45. Attaching Two Shelf Slides

Four Slot Cradle

To attach the shelf slide to the wall mount bracket for use with a four slot cradle:

1. Place a slide on the left-hand bracket, aligning the larger pan-head screw holes in the slide with the left two screw holes on the bracket.
2. Secure the slide to the bracket by inserting the two pan-head screws provided from below the bracket, up through the bracket's screw holes and then through the slide's pan-head screw holes.
3. Place a slide on the right-hand bracket, aligning the larger pan-head screw holes in the slide with the right two screw holes on the bracket.
4. Secure the second slide to the bracket as described in Step 2.

Installing the Cradle/Charger on the Bracket

Install the cradle or charger onto the bracket, inserting the bracket's slide into the grooves on the bottom of the cradle/charger and sliding the cradle/charger into the desired position.

1. For one single slot cradle/four slot charger, center it on the bracket.

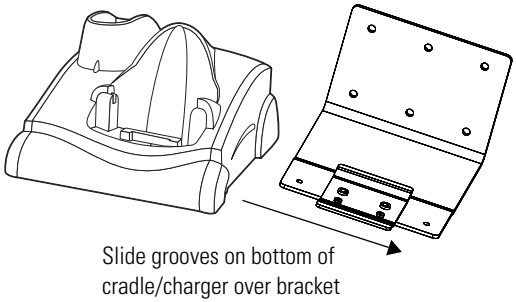


Figure 7-46. Attaching Two Shelf Slides

2. For two single slot cradles/four slot chargers, slide one onto the left-hand slide, and one onto the right-hand slide

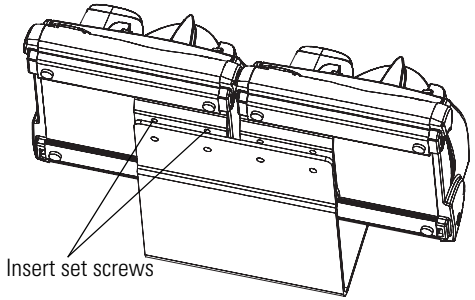


Figure 7-47. Attaching Two Shelf Slides

3. For a four slot cradle, slide the cradle on to the slides, across both brackets.
4. Secure each cradle or charger to its slide using the two set screws provided.
5. Position the power supply on the shelf, behind the cradle.

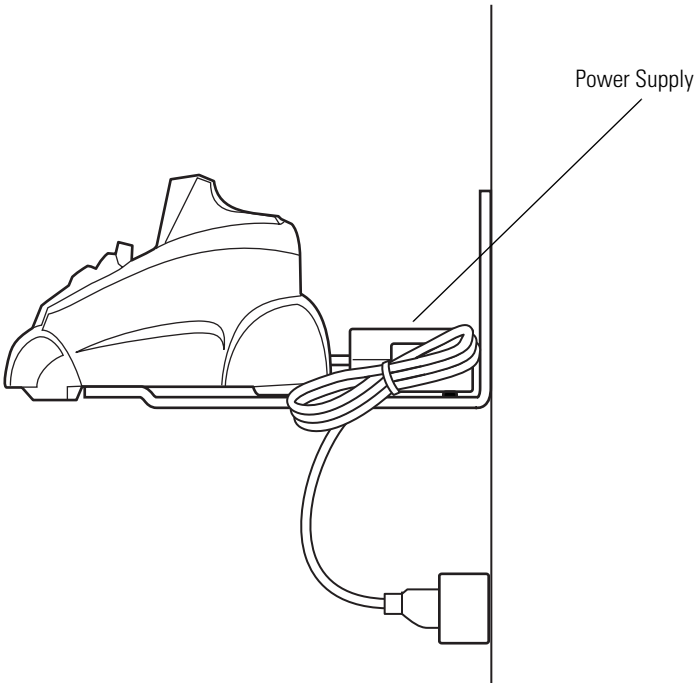


Figure 7-48. Positioning the Power Supply

8

Software Installation

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Introduction

The *Symbol Windows CE SMDK for Series 9000* allows users to develop Windows CE applications for Series 9000 mobile computers. This SMDK contains libraries and other Symbol value-add software not available in the standard Microsoft® Windows® CE Platform SMDK.

Symbol Windows CE SMDK

The SMDK installation program loads the required Windows CE components on the development computer used to create the image files for download to the mobile computer.

Hardware Requirements

The minimum system configuration required to install the SMDK is:

- IBM-compatible Personal Computer with Pentium 450 MHz processor or higher
- Microsoft Windows XP®, or Microsoft Windows 2000® operating system
- 128 MB RAM
- 100 MB available hard disk space
- CD-ROM drive
- One available serial port
- Mouse.

Software Requirements

Before installing the Symbol Windows CE SMDK for Series 9000, install the following tools:

- Microsoft eMbedded Visual C++ v4.0 and Service Pack 1
- Microsoft ActiveSync version 3.7 or higher
- Adobe® Acrobat® Reader® 3.0 or higher.

SMDK Components

The SMDK installation program loads all of the SMDK, Series 9000 components onto the development computer. Once installed, the SMDK allows users to create applications and deploy the applications to mobile computers.

The Symbol Windows CE SMDK for Series 9000 includes the following components:

- Help HTML-based help file containing the Symbol API definitions.
- PRG Product Reference Guide containing information about the setup and use of the mobile computer.
- Readme HTML-based file containing release notes and last minute help updates.
- Samples Sample source code, showing how to interface with Symbol API functions.
- Emulator Series 9000 Desktop emulation environment.
- TCM Terminal Configuration Manager program used to customize and load software.

Installing the SMDK

1. Download the SMDK from the Symbol website, http://devzone.symbol.com.
2. Double-click the executable file and follow the install screen prompts.
3. Once installed, the major components of the SMDK can be accessed from the *Symbol Windows CE SMDK (PDT9000)* program group of the Windows Start Menu. The components include: Help, PRG, Readme, Samples, TCM, Emulator and Updates.
4. The sample applications provide a good overview of the SMDK usage. To build a sample application, open the *Samples* folder from the Windows *Start* menu. Open the folder for the desired sample and then open the project file. The project file has an extension of *VCP*. Microsoft Visual C++ v4.0 will automatically launch. Select *PDT9000* as the *Active WCE Configuration. Select Win32 (WCE ARMV4) Debug* as the *Active Configuration.*



If both Microsoft Visual C++ v3.0 and Microsoft Visual C++ v4.0 are installed on the development computer then confirm that Microsoft Visual C++ v4.0 is the one being launched.

Software Updates

Updates to the SMDK can be downloaded from the Symbol Developer Zone web site at http://devzone.symbol.com. This site can be easily accessed using a shortcut added to the Windows start menu. It should be checked periodically for important updates and new software versions.

9

AirBEAM Smart

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Introduction

The AirBEAM Smart product allows specially designed software packages to be transferred between a host server and Symbol wireless handheld devices. Before transfer, AirBEAM Smart checks and compares package version, so that only updated packages are loaded.

AirBEAM Smart resides on radio-equipped client devices and allows them to request, download and install software, as well as to upload files and status data. Both download and upload of files can be accomplished in a single communications session. The ability to transfer software over a radio network can greatly reduce the logistical efforts of client software management.

In an AirBEAM Smart system, a network-accessible host server acts as the storage point for the software transfer. The AirBEAM Smart Client uses the industry standard FTP or TFTP file transfer protocols to check the host system for updates and if necessary, to transfer updated software.

AirBEAM Package Builder

In a typical distributed AirBEAM Smart system, software to be transferred is organized into packages. In general, an AirBEAM Smart package is simply a set of files that are assigned attributes both as an entire package and as individual component files. The package is assigned a version number and the transfer occurs when an updated version is available.

An AirBEAM Smart package can optionally contain developer-specified logic to be used to install the package. Installation logic is typically used to update client device flash images or radio firmware. Examples of common AirBEAM Smart packages would include packages for custom client application software, radio firmware and AirBEAM Smart Client software.

Once these packages are built, they are installed on the host server for retrieval by the handheld device. The AirBEAM Package Builder is a utility used to define, generate and install AirBEAM packages to a server. The packages are then loaded from the server onto a client device equipped with an AirBEAM Smart Client executable.

For detailed instructions on how to define, generate and install AirBEAM packages to the server, refer to the *AirBEAM Package Builder Product Reference Guide*, p/n 72-55769-xx.

AirBEAM Smart Client

The AirBEAM Smart Client is installed on the handheld mobile computer. It is configured with the server access information, the names of the packages to be downloaded and other controlling parameters. When the AirBEAM Smart Client is launched, the device connects to the specified FTP server and checks the packages it is configured to look for. If the package version was updated, the client requests the transfer.

AirBEAM Smart License

The AirBEAM Smart Client is a licensed software product. The AirBEAM Smart Client's version synchronization functionality is enabled through a license key file that is stored on the client device. The license key file can be built into AirBEAM Smart Client's image, or downloaded in a special AirBEAM package. The AirBEAM Smart license key file contains a unique key and a customer specific banner that is displayed when the AirBEAM Smart Client version synchronization logic is invoked.

The AirBEAM Smart Client package that is included on the mobile computer does not include a licence key. This software version is limited to downloading of specific Symbol software products. A license key can be purchased that will allow the downloading of custom applications and other non-Symbol software products.

Configuring the AirBEAM Smart Client

1. Select *Start - Programs - AirBEAM Client*. The *AirBEAM CE* window appears.
2. Tap *File - Configure*. The *AirBEAM* configuration window appears

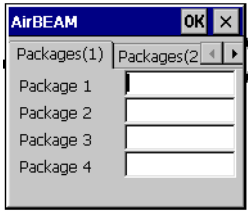
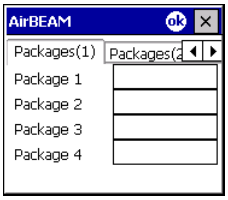


Figure 9-1. AirBEAM Smart Configuration Window

The configuration window is used to view and edit AirBEAM Smart Client configurations. This dialog box has six tabs that can be modified - Packages(1), Packages(2), Server, Misc(1), Misc(2) and Misc(3).

Packages(1) Tab

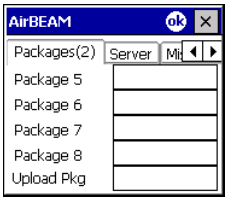


This tab is used to specify the package name of the first four of eight packages that are to be loaded during the AirBEAM Smart synchronization process. The specified package name must correspond to a package that is available on the specified package server.

Table 9-1. Package (1) Tab

Field	Description
Package 1	Package name of the first of eight packages. This is an optional field.
Package 2	Package name of the second of eight packages. This is an optional field.
Package 3	Package name of the third of eight packages. This is an optional field.
Package 4	Package name of the fourth of eight packages. This is an optional field.

Packages(2) Tab



This tab is used to specify the package name of the last four of eight packages that are to be loaded during the AirBEAM Smart synchronization process. The specified package name must correspond to a package that is available on the specified package server.

Table 9-2. Package (2) Tab

Field	Description
Package 5	Package name of the fifth of eight packages. This is an optional field.
Package 6	Package name of the sixth of eight packages. This is an optional field.
Package 7	Package name of the seventh of eight packages. This is an optional field.
Package 8	Package name of the eighth of eight packages. This is an optional field.
Upload Pkg	Package name of a package that is to be processed for “upload files” during the AirBEAM Smart synchronization process. The specified package name must correspond to a package that is available on the specified package server. This is an optional field.

Server Tab

This tab is used to specify the configurations of the server to which the client connects during the package synchronization process.

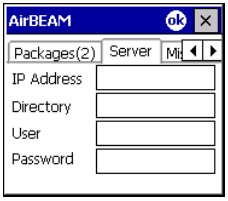


Table 9-3. Server Tab

Field	Description
IP Address	The IP Address of the server. It may be a host name or a dot notation format.
Directory	The directory on the server that contains the AirBEAM Smart package definition files. All AirBEAM Smart package definition files are retrieved from this directory during the package synchronization process.
User	The FTP user name that is used during the login phase of the package synchronization process.
Password	The FTP password that corresponds to the FTP user specified in the **User** field. The specified password is used during the login phase of the package synchronization process.

Misc(1) Tab

This tab is used to configure various miscellaneous features.

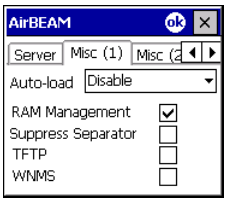


Table 9-4. Misc (1) Tab

Field	Description
Auto-load	This drop-down list is used to specify how the AirBEAM Smart Client is to be invoked automatically when the client device is rebooted. The selections are: Disable: the AirBEAM Smart Client is not invoked automatically during the boot sequence. Interactive: the AirBEAM Smart Client is invoked automatically during the boot sequence. The package synchronization process is started automatically. The Synchronization Dialog box appears and the user is required to press the **OK** button when the process is complete. Non-interactive: the AirBEAM Smart Client is invoked automatically during the boot sequence. The package synchronization process is started automatically. The Synchronization Dialog box is displayed, but the user is not required to tap **OK** when the process is complete. The *Synchronization Dialog* box terminates automatically. Background: the AirBEAM Smart Client is invoked automatically during the boot sequence. The package synchronization process is started automatically. Nothing is displayed while the synchronization process is occurring.
RAM Management	This checkbox specifies whether the automatic RAM management is enabled during the package synchronization process. If enabled, RAM management logic is invoked when there is not enough free disk space to download a package. The RAM management logic attempts to remove any discardable AirBEAM Smart packages resident on the client.
Suppress Separator	This checkbox specifies whether the automatic insertion of a file path separator character should be suppressed when the client generated server package definition file names. When enabled, the parameter also disables the appending of .apd to the package. This feature is useful for AS/400 systems, in which the file path separator character is a period. When this feature is enabled, the server directory (Directory) and package name (Package 1, Package 2, Package 3 and Package 4) are appended "as is" when building the name for the server package definition file. When this feature is disabled, a standard file path separator is used to separate the server directory (Directory) and package name (Package 1, Package 2, Package 3 and Package 4) when building the name for the server package definition file. In addition, an .apd extension is appended automatically.

Table 9-4. Misc (1) Tab (Continued)

Field	Description
TFTP	This checkbox specifies whether the TFTP protocol is to be used to download files. By default, the AirBEAM Smart Client uses the FTP protocol.
WNMS	This checkbox specifies whether the AirBEAM Smart Client uploads a WNMS information file at the end of each version synchronization.

Misc(2) Tab

This tab is used to configure various miscellaneous features.

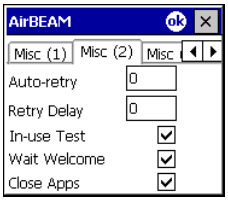


Table 9-5. Misc (2) Tab

Field	Description
Auto-retry	This field is used to specify whether the AirBEAM Smart Client automatically retries if there is a failure during the synchronization process. If this feature is enabled, the AirBEAM Smart Client displays a popup dialog indicating the attempt of a retry. The popup dialog is displayed for the number of seconds specified in the *Retry Delay* field. The valid values for this field are: **-1**: the AirBEAM Smart Client automatically retries indefinitely. **0**: the AirBEAM Smart Client does not automatically retry. **-0**: the AirBEAM Smart Client automatically retries up to the number of times specified.
Retry Delay	This field specifies the amount of time, in seconds, that the AirBEAM Smart Client will delay before automatically retrying after a synchronization failure.
In-use Test	This checkbox specifies whether the AirBEAM Smart Client tests to determine if a file is in-use before downloading. If the *In-use Test* feature is enabled, the AirBEAM Smart Client downloads a temporary copy of any files that are in-use. If any temporary in-use files are downloaded the AirBEAM Smart Client automatically resets the client to complete the copy of the in-use files. If the *In-use Test* feature is disabled, the synchronization process fails (-813) if any download files are in-use.
Wait Welcome	This checkbox specifies whether the AirBEAM Smart Client waits for the WELCOME windows to be completed before automatically launching the synchronization process after a reset.

Table 9-5. Misc (2) Tab (Continued)

Field	Description
Close Apps	This checkbox specifies whether the AirBEAM Smart Client automatically attempts to close non-system applications prior to resetting the mobile unit. If enabled the AirBEAM Smart Client sends a WM_CLOSE message to all non-system applications before resetting the mobile unit. This feature offers applications the opportunity to prepare (i.e. close open files) for the pending reset.

Misc(3) Tab

This tab is used to configure various miscellaneous features.

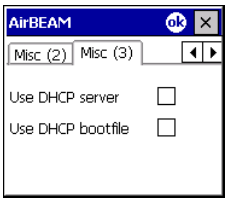


Table 9-6. Misc (3) Tab

Field	Description
Use DHCP server	This checkbox control specifies whether the AirBEAM Smart Client uses the DHCP response option 66 to specify the *IP address* of the FTP/TFTP server. If enabled, special RF network registry settings are required to force the DHCP server to return the "TFTP server name" field (option 66). The special RF network registry settings are included, but commented out, in the radio network registry initialization files (essid_xxxx_yy.reg).
Use DHCP bootfile	This check box control specifies whether the AirBEAM Smart Client uses the DHCP response option 67 to specify the *Package* and *Package 1* parameters. If enabled, special RF network registry settings are required to force the DHCP server to return the "Bootfile name" field (option 67). The special RF network registry settings are included, but commented out, in the radio network registry initialization files (essid_xxxx_yy.reg).

Synchronizing with the Server

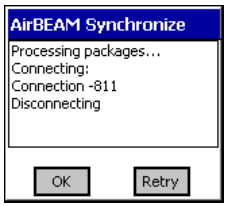
When the synchronization process is initiated, the AirBEAM Smart Client attempts to open an FTP session using the AirBEAM Smart Client configuration. Once connected, the client processes the specified packages. Packages are loaded only if the server version of a given package is different from the version loaded on the client. Once the upload process is complete, the AirBEAM Smart Client closes the FTP session with the server.

The AirBEAM Smart Client can launch an FTP session with the server either manually, when initiated by the user, or automatically.

Manual Synchronization

1. Configure the AirBEAM Smart Client. See *Configuring the AirBEAM Smart Client on page 9-4*.
2. From the main *AirBEAM Smart* window, select *File - Synchronize*.

3. Once connected, the AirBEAM Synchronize window appears.
   - The Status List displays status messages that indicate the progress of the synchronization process.
   - Tap **OK** to return to the Main Menu. This button remains inactive until the synchronization process is complete.
   - Tap **Retry** to restart the synchronization process. This button is activated only if there is an error during the synchronization process.



Automatic Synchronization

The AirBEAM Smart Client can be configured to launch automatically using the Misc(1) Preference tab, see *Misc(1) Tab on page 9-7*. When setting automatic synchronization, use the Auto-load drop-down list is to specify how the AirBEAM Smart Client should be invoked automatically when the client device is rebooted. See *Misc(1) Tab on page 9-7* for instructions on enabling Auto Sync.

AirBEAM Smart Staging

The AirBEAM Smart staging support is intended to speed up and simplify the process of staging custom or updated operating software onto mobile devices directly from manufacturing. The staging support is part of the AirBEAM Smart CE Client that is integrated into the mobile computer.

The AirBEAM Smart support works by defaulting the AirBEAM Smart Client configuration to a known set of values and launching the AirBEAM Smart package download logic. A staging environment, including an RF network, FTP server and AirBEAM Smart packages must be setup. Ideally a staging network and server should be setup to match the default AirBEAM Staging client configuration.

The AirBEAM Smart staging utility is invoked by selecting the *Files* icon from the *Series 9000 Demo* screen, select *\Platform\AirBeam* and double tap on the *abstage.lnk* file.

The AirBEAM Staging support provides several benefits:

- Many devices can be simultaneously loaded over the RF network.
- The AirBEAM staging utility provides a simple single dialog user interface that is used to quickly start the software installation process.

10

Mobile Computer Configuration

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Introduction

Terminal Configuration Manager (TCM) is an application used to customize flash file system partitions for the mobile computer. The most common use is to create an application partition hex file that contains the customer's application. TCM can also be used to load hex files to the flash memory of the mobile computer.

The program resident on the mobile computer that receives the hex file and burns it to the flash memory is called Initial Program Loader (IPL).

The customization of partitions is controlled by TCM scripts. The scripts contain all of the necessary information for building an image. The script is a list of copy commands specifying the files to copy from the development computer to the partition.

TCM works with a pair of directory windows, one displaying the script and the other displaying the source files resident on the development computer. Using standard windows drag and drop operations, files can be added and deleted from the script window.

The SMDK includes scripts used by Symbol Technologies to build the standard factory installed *Platform* and *Application* partitions provided on the mobile computer. The standard *Platform* partition contains drivers while the *Application* partition contains demo applications and optional components. The standard TCM scripts can be found in the following folder: *C:\Program Files\Symbol Windows CE SMDK (PDT9000)\SymbolPlatforms \PDT9000\TCMScripts*.



Before creating a script to build a hex image, identify the files required (system files, drivers, applications, etc.) and locate the files' source directories to make the script building process easier.

The required processes for building a hex image in TCM include:

- Starting TCM
- Defining script properties
- Creating the script for the hex image
- Building the image
- Sending the hex image
- Creating a splash screen
- Flash storage.

Starting Terminal Configuration Manager

Click the Windows start menu TCM icon (*Symbol Windows CE SMDK for Series 9000*) to start TCM. The *TCM* window appears displaying two child windows: *Script1* and *File Explorer*. The *Script1* window contains a newly created script and the *File Explorer* window contains a file explorer view used for selecting files to be placed in the script.

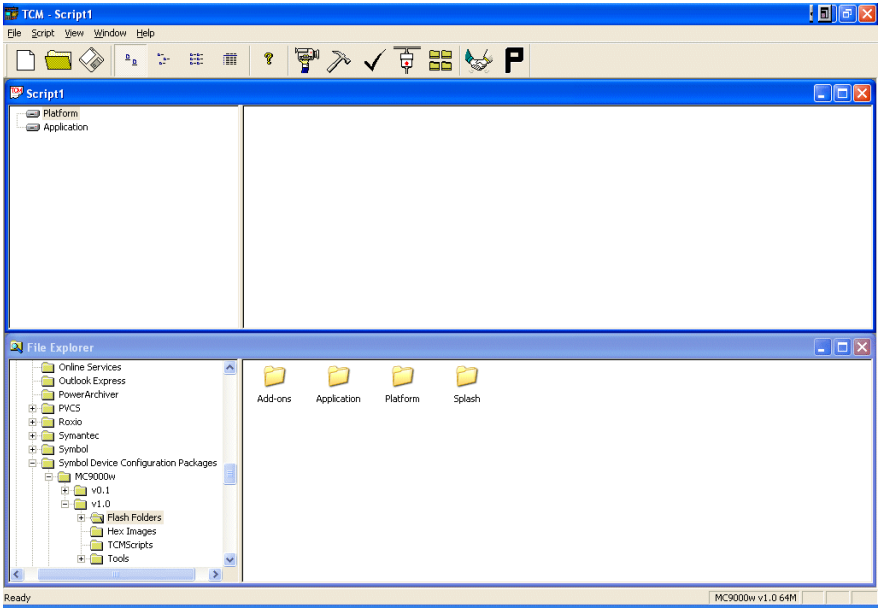


Figure 10-1. TCM Startup Window

The following table lists the components of the TCM window.

Table 10-1. TCM Components

Icon	Component	Function
	Script Window	Displays the files to be used in the creation of the partition(s).
	File Explorer Window	Used to select the files to be added to the script.
	Create button	Create a new script file.
	Open button	Open an existing script file.
	Save button	Save the current script file.
	Large icons button	View the current script items as large icon.
	Small icons button	View the current script items as small icon.
	List button	View the current script items as a list.
	Details button	View the current script items with more details.
	About button	Display version information for TCM.

Table 10-1. TCM Components (Continued)

Icon	Component	Function
	Properties button	View/change the current script properties.
	Build button	Build the current script into a set of hex files.
	Check button	Check the script for errors (files not found).
	Send button	Download the hex image to the terminal.
	Tile button	Arrange the sub-windows in a tiled orientation.
	Build and Send	Build the current script into a set of hex images and send the hex images to the mobile computer.
	Preferences button	View/change the global TCM options.

Defining Script Properties

Before a script is created, the script properties must be defined. This defines the type of terminal, flash type, number of disks being created and the memory configuration of each disk partition.

To define the script properties:

1. Select the *Script* window to make it active.
2. Click the **Properties** button. The *Script Properties window - Partition Data* tab appears.

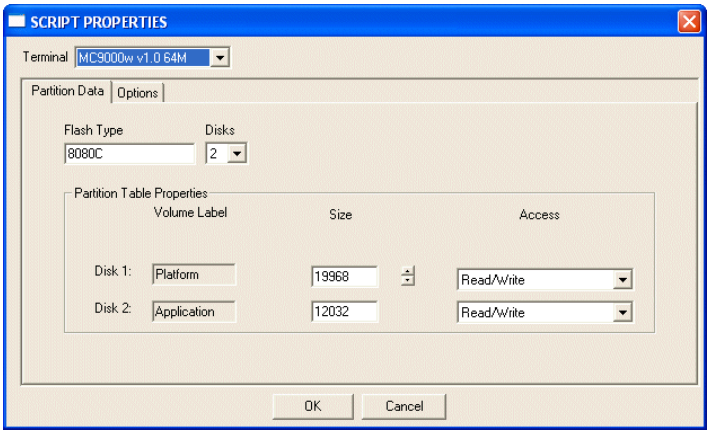


Figure 10-2. Script Properties Window - Partition Data Tab

3. In the *Terminal* drop-down list, the *MC9000w v1.0 64M* entry is already selected.
4. Use the default *Flash Type*.
5. In the *Disks* drop-down list, *s*elect the number of disk partitions to create.
6. Select the (memory) *Size* for each partition. Note that adding space to one disk. partition subtracts it from another.
7. In the *Access* drop-down list for each disk partition, determine and select the Read/Write access option.

8. Click the *Options* tab. The *Script Properties window - Options* tab appears.

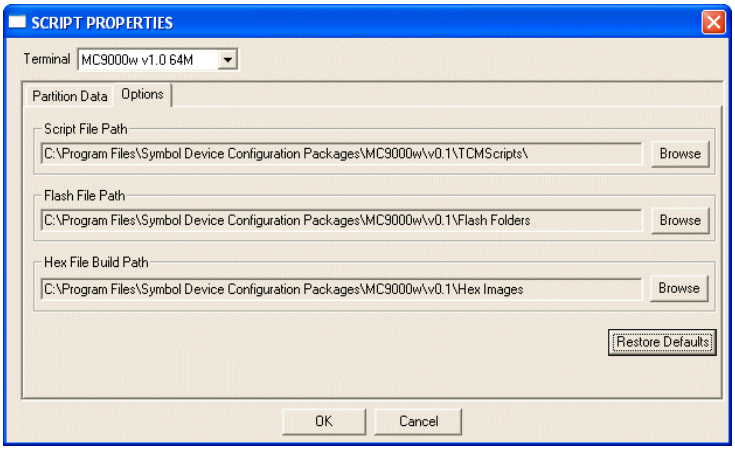


Figure 10-3. Script Properties Window - Options Tab

9. Set the paths for the Script File, Flash File and Hex File Build.
10. Click **OK**.

Creating the Script for the Hex Image

On start-up, *TCM* displays the *TCM* window with the *Script1* window and *File Explorer* window pointing to the following directory:

\Program Files\Symbol Device Configuration Packages\MC9000w\v0.1\TCMScripts\

The *Script1* window directory pane displays two partitions: *Platform* and *Application*. Depending on the type of flash chip, the number of partitions may change. Files can be added to each of the partitions. TCM functionality includes:

- Opening a new or existing script file
- Copying components to the script window
- Saving the script file.

Opening a New or Existing Script

A script file can be created from scratch or based on an existing script file. Click **Create** to create a new script or click **Open** to open an existing script (for example, a script provided in the Series 9000 SMDK). If an existing script is opened and changes are made, saving the changes overwrites the original script. To use an original or Symbol supplied standard script as a base and save the changes in a new script, use the *Save As* function to save the script using a different file name.

Updating TCM 1.X Scripts

Script files that were created with older versions of TCM can be upgraded to TCM 2.0 scripts. Click **Open** to open an existing script created with an older version of TCM. The *Conversion* window appears automatically.

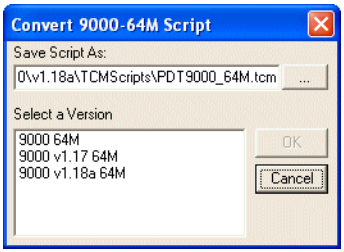


Figure 10-4. Conversion Window - Upgrading to TCM 2.0

Copying Components to the Script

Script contents are managed using standard file operations such as *New Folder*, *Delete* and *Rename*. Items can be added to the script by clicking files and folders in the *File Explorer* window and dragging them to the *Script* window. The *File Explorer* window supports standard windows; multiple files may be selected by clicking while holding the **SHIFT** or **CTRL** keys.

Saving the Script

Modifications to a script file can be saved using the *Save* or the *Save As* function. Saving changes to an existing script writes over the original script. To use a Symbol-supplied standard script as a base and save the changes in a new script, use the *Save As* function.

Building the Image

Once the script is created, the hex image defined by the script can be built.

As part of the build, TCM performs a check on the script which verifies that all files referenced in the script exist. This check is important for previously created scripts to ensure that files referenced in the script are still in the designated locations.

To build scripts:

1. Click **Build** on the TCM toolbar. The *Configure Build* window appears.

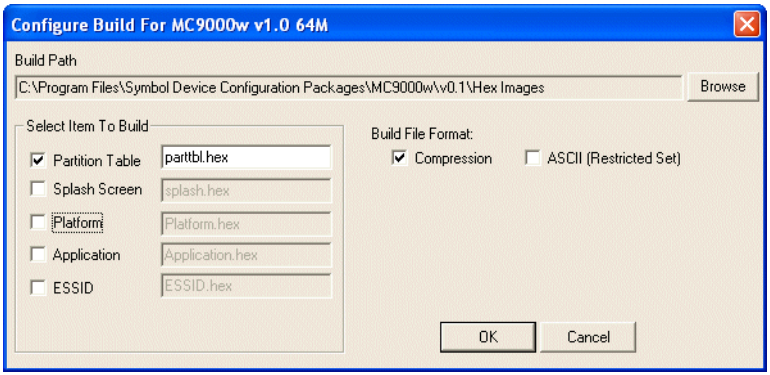


Figure 10-5. Configure Build Window

2. Select the items (partitions) to build using the check box(es) to the left of each named partition.
3. The *Build Path* defines where to store all built partitions.
4. Select (hex image) COMPRESSION to reduce the size and speed up the download.
5. Click **OK** and follow the on-screen instructions.

If one of the partitions being built is the ESSID, a prompt appears requesting the ESSID value. Deselect the HR (High Rate) check box when building ESSID images for a device with an FH radio.

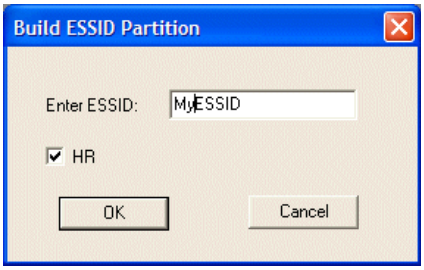


Figure 10-6. Build ESSID Partition Window

If one of the partitions being built is the Splash Screen, a prompt appears requesting both the source Bitmap file and the destination HEX file.

6. A check is performed and if there are no errors, the partition hex files are created.

If the build fails, the hex files are not be created and TCM displays an error message. Two of the most common reasons for a build failure are:

- Files defined in the script can not be found. This error can occur when the files referenced by the script are no longer stored on the development computer or the folders where they are stored were renamed.
- The total amount of flash memory space required by the script exceeds the image size. To correct this, reduce the number of files in the partition or increase the size of the partition. See *Defining Script Properties on page 10-7* for more information about setting the image size appropriately.

Sending the Hex Image

Once the hex file is built, it can be downloaded to the mobile computer.

To load the hex files on to the mobile computer:

1. For downloads using a serial connection, connect the mobile computer to the development computer using the Single Slot Serial/USB cradle or CAM.
2. Press and hold the left scan button and the Power button simultaneously until the mobile computer resets into IPL.

Note

The mobile computer must be inserted in the cradle or attached to the CAM, both with their appropriate power supplies connected to a power source, for the mobile computer to reset into IPL.

3. When the *Initial Program Loader* menu appears, release the scan and Power buttons.

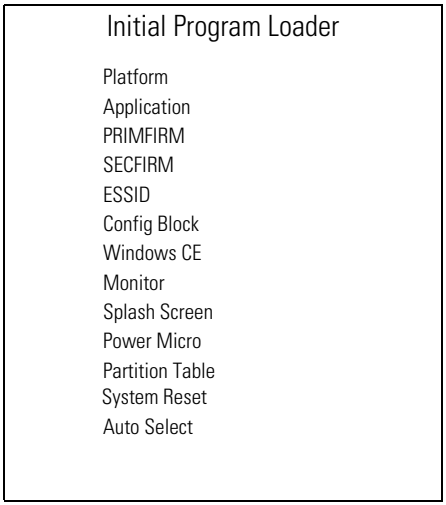


Figure 10-7. Initial Program Loader (IPL) Menu

CAUTION

To ensure a successful download, d*o not remove power from the mobile computer while in IPL mode.*

4. Choose Auto Select or use the up and down scroll buttons to select the partition to download, then press **Enter**.

Table 10-2. IPL Menu Partitions

Partition Name	Description
Platform	Contains the files in the *Platform* folder.
Application	Contains the files in the *Application* folder.
PRIMFIRM	Contains the primary radio firmware for the Spectrum24 HR radio card. Note: These partitions must be loaded to use wireless downloads through IPL with the HR radio. They are only used by IPL and are not required by the Operating System or the S24 FH radios.
SECFIRM	Contains the secondary radio firmware for the Spectrum24 HR radio card. Note: These partitions must be loaded to use wireless downloads through IPL with the HR radio. They are only used by IPL and are not required by the Operating System or the S24 FH radios.
ESSID	Identifies the ESSID, used for wireless downloads. Note: This partition specifies the ESSID to be used for IPL downloads via all S24 radios. If the partition is not present, then an ESSID of 101 is assumed. This partition is only used by IPL and is not required by the Operating System.
Config Block	Contains information to correctly configure the Operating System for the mobile computer. This information is loaded by the manufacturer. Note: Great care should be taken to ensure that an incorrect config block is not loaded into the mobile computer. Loading an incorrect config block prevents the correct operation of the computer.
Windows CE	Contains the operating system for the mobile computer.
Monitor	Contains the Monitor and IPL programs.
Splash Screen	Contains the splash screen that displays while booting the mobile computer. Note: Splash screens are generated from .bmp images and must be less than or equal to 240 pixels wide and 296 pixels deep. For mono displays, the bmp image must be 4 bpp and for color screens the color depth must be 8 bpp. Note: 8 bits per pixel only applies to splash screen images. Once Windows CE is running, the color density is 16 bits per pixel.
Power Micro	The Power Micro is a small computer contained within the mobile computer that controls several system resources. In the unlikely event that the Power Micro Firmware needs updating, selecting this item allows the device to be programmed.
Partition Table	Contains the partition information for all other partitions. Note: The partition table should never need changing unless the sizes of the platform and application images are changed within TCM. If this is done, then the new partition table should be loaded first, followed by both platform and application in any order.

Table 10-2. IPL Menu Partitions (Continued)

Partition Name	Description
System Reset	Selecting this item provides a simple method to exit IPL and to boot the operating system.
Auto Select	Selecting this item allows one or more files to be downloaded without having to manually select the destination. (The content of the files being downloaded automatically directs the file to the correct destination.) For technical reasons, Auto Select cannot be used to download Monitor, Power Micro, or Partition Table. These items must be specifically selected.

Note

If the platform or application partition sizes are changed, a new partition table must be downloaded first.

5. IPL displays the *Select Transport* menu which lists the available methods of downloading the file.

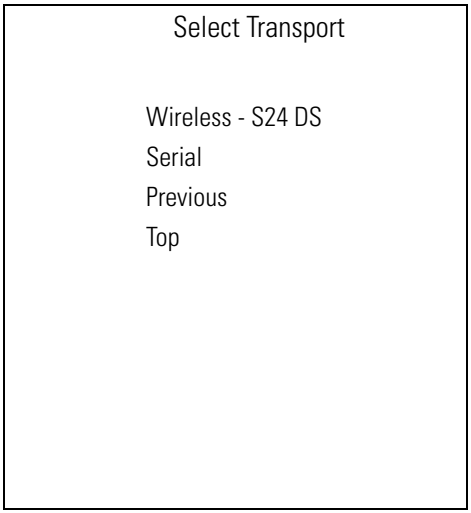


Figure 10-8. Select Transport Menu

Note

If the mobile computer does not have a radio, then the *WirelessS24XX* selection is not available on the *Transport* menu.

6. Use the up and down scroll buttons to select the method of transport, then press **Enter**.
7. If the *Serial* transport method is selected, the *Baud Rate Menu* appears.

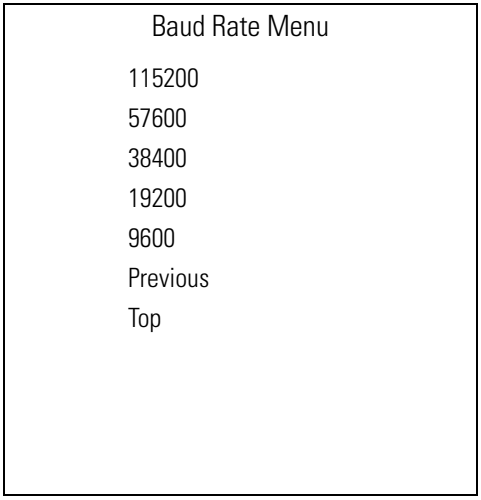


Figure 10-9. Baud Rate Menu

8. Use the up and down scroll buttons to select the appropriate baud rate, then press **Enter**.

9. If the *Wireless S24XX* transport method was selected, the *Address Configuration* menu appears.

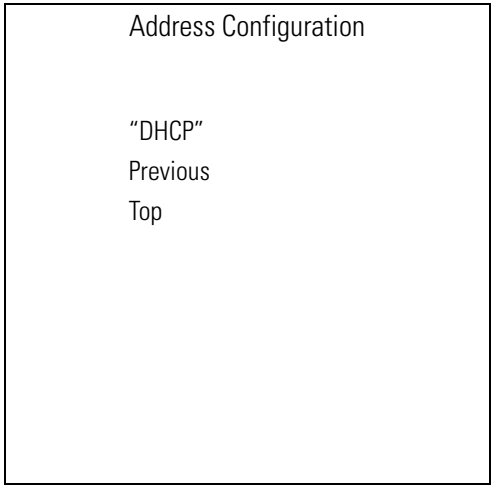


Figure 10-10. Address Configuration Menu

Note

For wireless downloads, the ESSID must be loaded via serial before Wireless S24 DS can be used. The PC running TCM must be on the same network as the terminal and the ESSID partition must be loaded with the correct ESSID.

10. Use the up and down scroll buttons to select DHCP, then press **Enter**.

11. The *Download File?* menu appears.

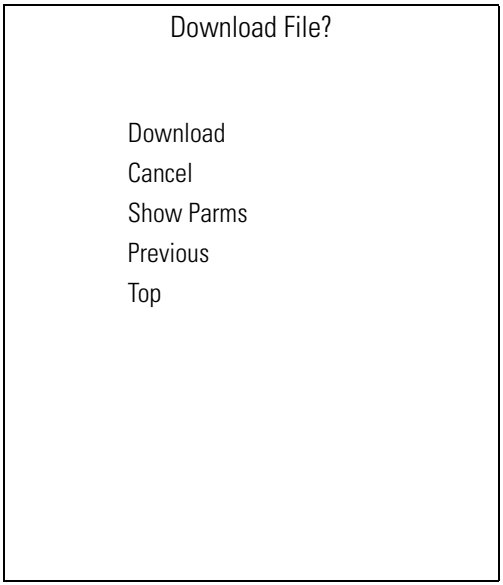


Figure 10-11. Download File? Menu

12. Use the up and down scroll buttons to select *Show Parms* to verify the file to download. Press **Enter** to display the *Parameters* screen.

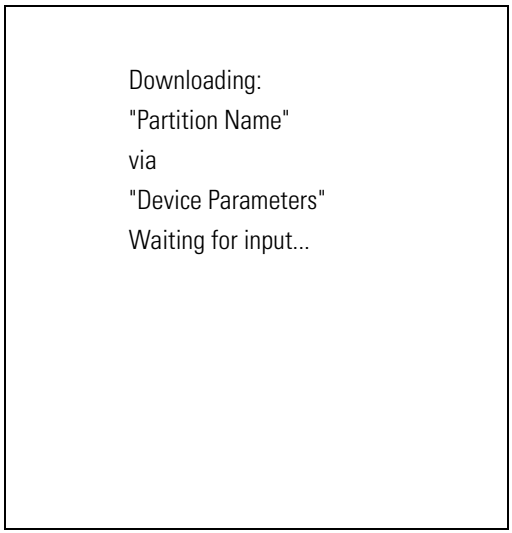


Figure 10-12. Parameters Screen

Partition Name is the name of the partition selected in the *Initial Program Loader* menu.

Device Parameters is the device selected in the *Select Transport* menu with the *baud rate* for serial downloads, or *DHCP address* for wireless downloads.

13. Press **Enter** to return to the *Download File?* menu.

14. Use the up and down scroll buttons to select *Download*. Press **Enter**. The *Downloading* screen appears.

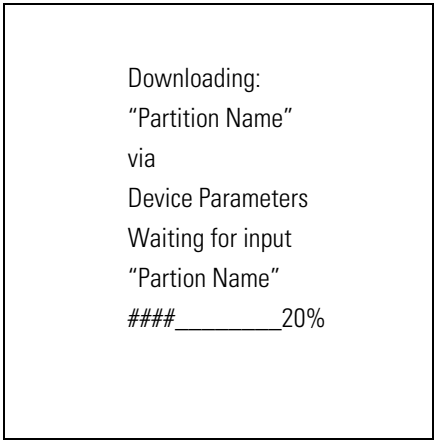


Figure 10-13. Downloading Screen

Before the download starts, if *Serial* was selected in the *Select Transport* menu, *Waiting for Data* appears in the *Device Status* field. If *Wireless S24 DS* was selected in the *Select Transport* menu, the IP address appears in the *Device Status* field.

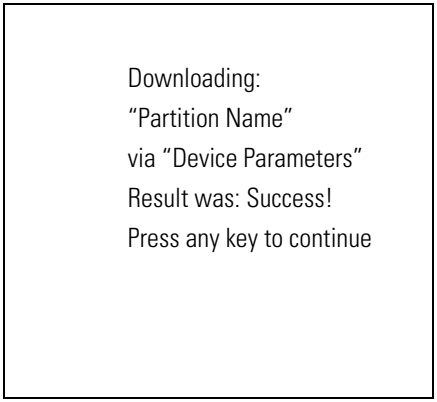


Figure 10-14. Downloading Complete Screen

15. On the development computer, click **Load** on the TCM toolbar. The *Load Terminal* window - *Serial* tab appears.

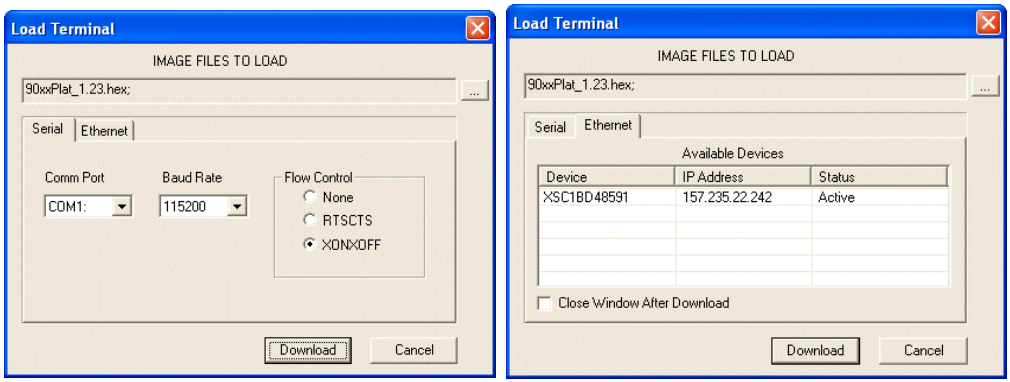


Figure 10-15. Load Terminal Window - Serial and Ethernet Tabs

16. For Serial port connections, click the *Serial* tab and select the *Image Files To Load*, *Comm Port* and *Baud Rate* from their respective drop-down lists.

    For Wireless connections, click the *Ethernet* tab. A list of available devices and their IP addresses appear. Only those devices placed into the Wireless transport mode of IPL appear in this dialog. Select the files to download and the device to receive the files. To load a device, the status must be "Active."

17. Click **Download** to begin the operation.
18. During download, the *Downloading* screen on mobile computer displays the *Device Status* and a progress bar.
19. When complete, *Device Status* displays *Result was Success*, or in the case of an error, the cause of the error.
20. On completion, press **Enter** to return to the IPL menu to select the next partition to download.
21. To exit IPL, select the *System Reset* item from the IPL menu (see *Figure 10-7 on page 10-12*).

TCM Error Messages

TCM validates the cells in the partition table when the Execute button is clicked. Cells highlighted in red contain an error. Partition loading is disabled until all errors are corrected.

Table 10-3. TCM Error Messages

Error	Description/Solution
Failed to build images: flash file system DLL not loaded!	TCM could not load the DLL required to build images for the targeting flash file system. Reinstall TCM or recover the DLL.
Failure finding directory xxx	Building process failed because directory xxx was not found.
Failure creating volume	Building process failed because a certain disk volume could not be created.
Failure adding system file to image	Build process failed because TCM failed to add a certain system file to the disk image.
INVALID PATH	The path for the image file to build is not valid.
Nothing Selected To Build	In the Config Build window, no item is selected to build.
Illegal ESS ID	In the Build ESSID Partition window, no ESS ID was entered or the ESS ID entered was illegal.
Disk Full	TCM failed to create Hex image file at the selected path. Check available disk space.
Target Disk Full	Build process failed because TCM failed to add file to the image of a disk volume. Remove some files or increase the disk size.
Hex file is READ ONLY	The Hex image file to be created exists and is read-only. Delete the existing file or change its attribute.
Error opening the file xxx with write access	TCM could not open file xxx with write access. Check if file is in use.
Failure creating binary file	TCM failed to open/create an intermediate binary file.
Hex File To load is missing or invalid	In Load Terminal window, the file selected to load has invalid status.
Could not locate terminal name in TCM.ini file	While loading the Script Properties window, TCM could not find the TCM.ini section corresponding to the terminal type specified by the current opening script. Either TCM.ini or the script file is invalid.
Incorrect disk sizes in TCM.ini file	The total disk size specified in the script does not match the total disk size defined in the corresponding TCM.ini section. Check if the script is corrupt or the TCM.ini has changed after the script was created.
INVALID DIRECTORY	In Script Properties window, the selected System File Path is not a valid directory.

Table 10-3. TCM Error Messages (Continued)

Error	Description/Solution
One of the disk sizes is one sector in size	In Script Properties window, one of the disks is too small (one sector in size). This may cause problem while building images, especially when cushion is enabled. Increase the disk size.
INVALID VOLUME NAME	In Script Properties window, one of the volume labels is not valid.
Corrupt TCM.INI file! (Invalid value of VolumeDivisor)	The VolumeDivisor entry is missing or invalid in the TCM.ini. Reinstall TCM or recover TCM.ini.
Invalid version of TCM script file	The TCM script was not created by this version of TCM.
Corrupt or missing TCM.ini file	TCM could not find TCM.ini file.
FAILED CONNECTION TO COM PORT (Could not get status)	While downloading images to terminal, TCM failed to connect to the selected COM port. Check if the COM port is free and is properly configured.
FAILED CONNECTION TO TERMINAL (Terminal Not Connected Properly/Terminal Not Ready to Receive)	While downloading images, TCM failed to connect to the terminal. Check if the correct flow control protocol is selected and the terminal is properly connected and is in a listening state.

IPL Error Detection

While receiving data, IPL performs many checks on the data to ensure that the data is received correctly. If an error is detected, IPL immediately aborts the download, and reports the error on an error screen.

Error screens may vary depending on the action being performed. A sample error screen may look like the screen pictured below:

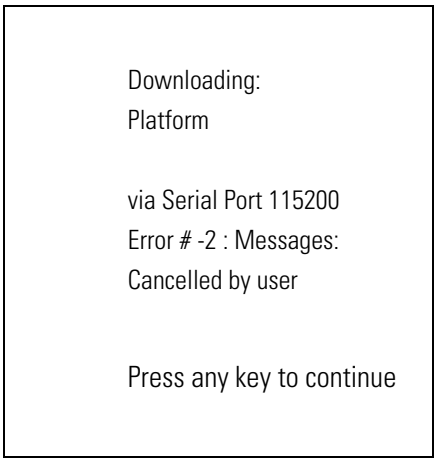


Figure 10-16. IPL Error Screen

This error message screen displays until a key is pressed. Once the screen is acknowledged, IPL returns to the *Initial Program Loader* main menu to wait for a new selection.

To find the probable cause of the error, use the error number and/or the error text displayed on the screen to look up the error in Table 10-4.

.

Table 10-4. IPL Errors

Error Text	Error Number	Probable Cause
Unknown error	-1	A general error occurred. Retry the download. If the failure persists, it is most likely due to a hardware failure; the terminal requires servicing.
Cancelled by user	-2	The user cancelled the download.

Table 10-4. IPL Errors (Continued)

Error Text	Error Number	Probable Cause
Can't open the source	-7	An error occurred opening the source device (either radio card or Serial port). Check source device connectivity and retry.
Can't open the destination	-8	An error occurred opening the destination device (either flash ROM or Power Micro). Retry the download. If the failure persists, it is most likely due to a hardware failure; the terminal requires servicing.
Can't read from the source device	-9	The source device (either radio card or Serial port) could not be read from. Check source device connectivity and retry.
Can't write to the destination device	-10	The destination device (either flash ROM or Power Micro) could not be written to. Retry the download. If the failure persists, it is most likely due to a hardware failure; the terminal requires servicing.
Transmission checksum error	-11	An error occurred during transmission from the source device (either radio card or Serial port) and the checksum check failed. Check source device connectivity and retry.
Readback checksum error	-12	A checksum, generated from reading back data that was written to the destination device, was incorrect. An error during transmission or a write error to the destination device could cause this.
There is no more heap space available	-14	There is no more heap space available for the download procedure. Restart IPL and retry the download. If the failure persists, contact service with details of what is being downloaded.
Insufficient data available to complete record	-21	A Symbol HEX file download was attempted but the HEX file is invalid. Ensure the file is in Symbol HEX file format.
Invalid Symbol HEX file	-23	A Symbol HEX file download was attempted but the HEX file is invalid. Ensure the file is in Symbol HEX file format.
Unrecognized or unsupported HEX record	-24	The Symbol HEX file being downloaded contains an invalid or unrecognized HEX record. Ensure the file is in proper Symbol HEX file format.

Table 10-4. IPL Errors (Continued)

Error Text	Error Number	Probable Cause
Invalid data in HEX file	-25	The Symbol HEX file being downloaded contains invalid data. Ensure the file is in proper Symbol HEX file format with valid HEX data.
Exceeded max size	-26	The download file is too large to fit into the space allocated for it. Either make the file smaller or increase the space allocated for it by altering the partition table.
Partition is not valid on this device	-27	The downloaded file specifies a partition entry that does not exist on the device. Only download files that are valid for this device, or change the partition table so that the new file is valid on the device.
Wrong destination code	-28	A specific partition was chosen from the Main Menu (not Auto Select) but the file selected for download was for another partition. Ensure that the partition selected from the Main Menu matches the file selected for download.
File type does not support IPL Auto Select	-29	Monitor, Power Micro and Partition Table cannot be loaded with Auto Select. Select the appropriate area, and try again.
Non-contiguous record found	-30	A Symbol HEX file download was attempted but the HEX file is invalid. Ensure the file is in Symbol HEX file format.
Timed Out - No data	-31	IPL was waiting for data from the source device but timed out before receiving any. Check the source device connectivity and retry.
Fail: Buffer Overrun	-32	The serial port device could not keep up with incoming data. Retry the serial download with a lower baud rate.
Partition Table not Valid	-33	The size of flash memory is different than that described in the partition table. Retry the download with the correct partition table file.
Invalid file format	-34	The file format is invalid. Only Symbol HEX files are supported by IPL.

Creating a Splash Screen

The source bitmap files used to create the default splash screens for the mobile computer are supplied with the Series 9000 SMDK. These files can be modified using any of the standard windows image editors, allowing customization for particular customers.

To create a custom splash screen, perform the following steps:

1. For mobile computers with monochrome screens, open the Splashmono.bmp file supplied with the Series 9000 SMDK using an image editor.
2. For mobile computers with color screens, open the Splashcolor.bmp file supplied with the Series 9000 SMDK using an image editor.
3. Modify the bitmap file and save.
4. Create a splash partition using the steps shown in the *Building the Image on page 10-10*.

Splash Screen Format

If the default files are not used to create the new splash screens, be sure to preserve the image format. The formats are as follows:

Table 10-5. Splash Screen Format

Screen Type	Dimensions	Color Format
Monochrome	240x296	4 bits per pixel
Color	240x296	8 bits per pixel*
* 8 bits per pixel only applies to splash screen images. Once Windows CE is running, the color density is 16 bits per pixel.		

See *Sending the Hex Image on page 10-11* for information about loading the splash screen using TCM and IPL.

Flash Storage

In addition to the RAM-based storage standard on Windows CE terminals, the mobile computer is also equipped with a non-volatile Flash-based storage area which can store data (partitions) that can not be corrupted by a cold boot. This Flash area is divided into two categories: Flash File System (FFS) Partitions and Non-FFS Partitions.

FFS Partitions

The mobile computer includes two FFS partitions. These partitions appear to the mobile computer as a hard drive that the OS file system can write files to and read files from. Data is retained even if power is removed.

The two FFS partitions appear as two separate folders in the Windows CE file system and are as follows:

- Platform: The Platform FFS partition contains Symbol-supplied programs and Dynamic Link Libraries (DLLs). This FFS is configured to include DLLs that control system operation. Since these drivers are required for basic mobile computer operation, only experienced users should modify the content of this partition.
- Application: The Application FFS partition is used to store application programs needed to operate the mobile computer.

Working with FFS Partitions

Because the FFS partitions appear as folders under the Windows CE file system, they can be written to and read like any other folder. For example, an application program can write data to a file located in the Application folder just as it would to the Windows folder. However, the file in the Application folder is in non-volatile storage and is not lost on a cold boot (e.g., when power is removed for a long period of time).

Standard tools such as ActiveSync can be used to copy files to and from the FFS partitions. They appear as the “Application” and “Platform” folders to the ActiveSync explorer. This is useful when installing applications on the mobile computer. Applications stored in the Application folder are retained even when the mobile computer is cold booted, just as the Demo 9000 program is retained in memory.

There are two device drivers included in the Windows CE image to assist developers in configuring the mobile computer following a cold boot: RegMerge and CopyFiles.

RegMerge.dll

RegMerge.dll is a built-in driver that allows registry edits to be made to the Windows CE Registry. Regmerge.dll runs very early in the boot process and looks for registry files (.reg files) in certain Flash File System folders during a cold boot. It then merges the registry changes into the system registry located in RAM.

Since the registry is re-created on every cold boot from the default ROM image, the RegMerge driver is necessary to make registry modifications persistent over cold boots.

RegMerge is configured to look in the root of two specific folders for .reg files in the following order:

\Platform

\Application

Regmerge continues to look for .reg files in these folders until all folders are checked. This allows folders later in the list to override folders earlier in the list. This way, it is possible to override Registry changes made by the Platforms partitions folders. Take care when using Regmerge to make Registry changes. The Series 9000 SMDK contains examples of .reg files.



Regmerge only merges the .reg files on cold boots. The merge process is skipped during a warm boot.

Typically, do not make modifications to registry values for drivers loaded before RegMerge. However, these values may require modification during software development. Since these early loading drivers read these keys before RegMerge gets a chance to change them, the mobile computer must be cold booted. The warm boot does not re-initialize the registry and the early loading driver reads the new registry values.

Do not use Regmerge to modify built-in driver registry values, or merge the same Registry value to two files in the same folder, as the results are undefined.

CopyFiles

Windows CE expects certain files to be in the Windows folder, residing in volatile storage. Windows CE maintains the System Registry in volatile storage. CopyFiles copies files from one folder to another on a cold boot. Files can be copied from a non-volatile partition (Application or Platform) to the Windows or other volatile partition during a cold boot. During a cold boot CopyFiles looks for files with a .CPY extension in the root of the Platform and Application FFS partitions (Platform first and then Application). These files are text files containing the source and destination for the desired files to be copied separated by ">". The following example from the file application.cpy is contained on the demo application partition included in the Series 9000 SMDK. It can also be obtained from the Symbol web site at http://devzone.symbol.com/.

Files are copied to the Windows folder from the Flash File System using copy files (*.cpy) in the following order:

\Platform

\Application

Example:

\Application\ScanSamp2.exe>\Windows\ScanSamp2.exe

This line directs CopyFiles to copy the ScanSamp2.exe application from the \Application folder to the \Windows folder.

Non-FFS Partitions

Non-FFS Partitions include additional software and data pre-loaded on the mobile computer that can be upgraded. Unlike FFS Partitions, these partitions are not visible when the operating system is running. They also contain system information. Non-FFS partitions include the following:

- Windows CE: The complete Windows CE operating system is stored on Flash devices. If necessary, the entire OS image may be downloaded to the mobile computer using files provided by Symbol. The current OS partition on the mobile computer is included as part of the TCM installation package. Any upgrades must be obtained from Symbol. This partition is mandatory for the mobile computer.
- Splash Screen: a bitmap smaller than 16 Kb (and limited to 8 bits per pixel) is displayed as the mobile computer cold boots. To download a customized screen to display, see *Creating a Splash Screen on page 10-26*.



8 bits per pixel only applies to splash screen images. Once Windows CE is running, the color density is 16 bits per pixel.

- IPL: This program interfaces with the host computer and allows downloading via cradle or serial cable any or all of the partitions listed above, as well as updated versions of IPL. Use caution downloading updated IPL versions; incorrect downloading of an IPL causes permanent damage to the mobile computer. IPL is mandatory for the mobile computer.
- Partition Table: Identifies where each partition is loaded in the mobile computer.

Downloading Partitions to the Terminal

TCM is used to specify a hex destination file for each partition and download each file to the terminal. This download requires a program loader stored on the terminal. The terminal comes with a program loading utility, Initial Program Loader (IPL), stored in the terminal's write-protected flash.

IPL

IPL allows the user to upgrade the mobile computer with software updates and/or feature enhancements.

Partition Update vs. File Update

There are two types of update supported by the mobile computer: partitions and files. The file system used by the mobile computer is the same as the file system used on a desktop computer. A file is a unit of data that can be accessed using a file name and a location in the file system. When a file is replaced, only the contents of the previous file are erased. The operating system must be running for a file to be updated, so the IPL cannot perform individual file updates as it is a stand-alone program that does not require the operating system to be running.

A typical partition is a group of files, combined into a single "partition" that represents a specific area of storage. Examples of partitions are the flash file systems such as Platform or Application. (Using the desktop computer comparison, these partitions are roughly equivalent to a C: or D: hard disk drive.) In addition to the "hard disk" partitions, some partitions are used for single items such as the operating system, monitor, or splash screen. (Again using a desktop computer comparison, these partitions are roughly the equivalent of the BIOS or special hidden system files.) When a partition is updated, all data that was previously in its storage region is erased - i.e. it is not a merge but rather a replacement operation. Typically, the operating system is not running when partitions are update, so IPL can perform partition updates.

Partition images for selected partitions can be created by TCM. All partition images suitable for use by IPL are in hex file format for transfer by TCM from the development computer to the mobile computer.

Upgrade Requirements

Upgrade requirements:

- The hex files to be downloaded (on development computer)
- A connection from the host computer and the mobile computer (either serial or wireless)
- TCM (on development computer) to download the files.

Once these requirements are satisfied, the mobile computer can be upgraded by invoking IPL and navigating the menus. See *Sending the Hex Image on page 10-11* for procedures on downloading a hex file to the mobile computer.

11 Desktop Emulator

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Introduction

This chapter provides basic instructions for installing and using the emulator. The emulator provides software API emulation of the actual MC9000-K and MC9000-S. The emulator consists of the following components:

- System Settings Dialog (SSD)
- Emulator User Interface (emulator skin)
- Simulated External File System (Flash, SD/MMC).

Software Requirements

The emulator requires the installation of eMbedded Visual C++ 4.0 and EvC 4.0 service pack 1, before the emulator can be installed. To download eMbedded Visual C++ 4.0 go to the Microsoft download website: http://www.microsoft.com/downloads/ and enter "eMbedded Visual C++ 4.0" into the keyword search parameters. Follow the prompts and download eMbedded Visual C++ 4.0 and EvC 4.0 service pack 1.

Installation Procedures

The emulator is automatically installed as part of the *Symbol Windows CE SMDK for Series 9000*, see *Installing the SMDK on page 8-4*.

Starting the Emulator

The emulator is designed to launch via the SSD. The SSD is accessed from the desktop *Start* menu under the PDT9000 program group.

1. In the PDT9000 program group, double-click *SSD.exe* file. The *Emulator System Settings* window appears.

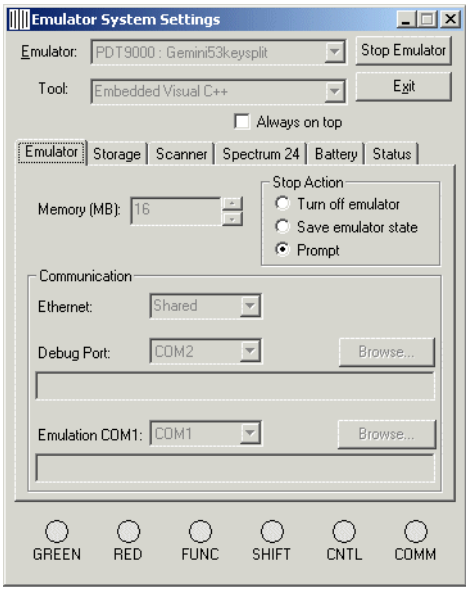


Figure 11-1. Emulator System Settings Window

2. Click the *Storage* tab to set the storage paths:
   \Application - Set Path to:

   C:\Program Files\Windows CE Tools\wce410\PDT9000\Emulation\Flash Partitions\Application

   \Platform - Set Path to:

   C:\Program Files\Windows CE Tools\wce410\PDT9000\Emulation\Flash Partitions\Platform

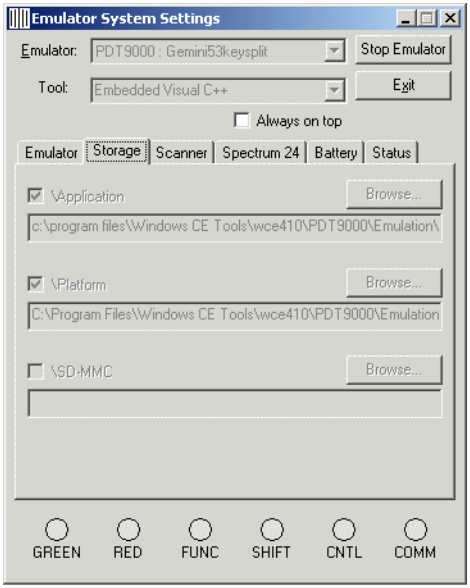


Figure 11-2. Emulator Startup Storage Settings

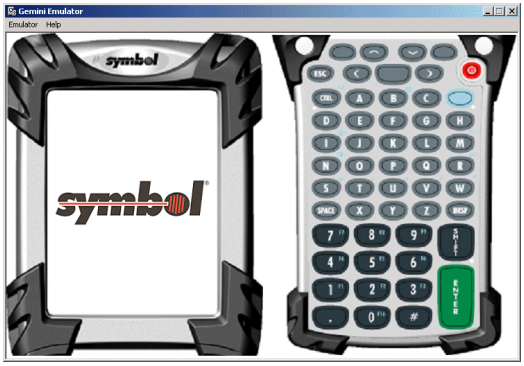
3. From the *Emulator* drop-down list, select either:
   PDT9000: Gemini53key for a full view of the mobile computer.

   or

   PDT9000: Gemini53keysplit for a split view of the mobile computer.
4. The Tool drop down window displays the selected *Embedded Visual C++* tool.



Gemini53key, Full View



Gemini53keysplit, Split View

Figure 11-3. Emulator View Options

5. Select the *Always on top* check box to keep the emulator view on top of all other programs, or leave the box unchecked to allow other programs to display on top of the emulator view.
6. Click **Launch** to start the emulator.

Emulator Parameter Settings and Displays

The *Emulator System Settings* window is divided into three parts, emulator settings, emulator tabs and emulator LEDs.

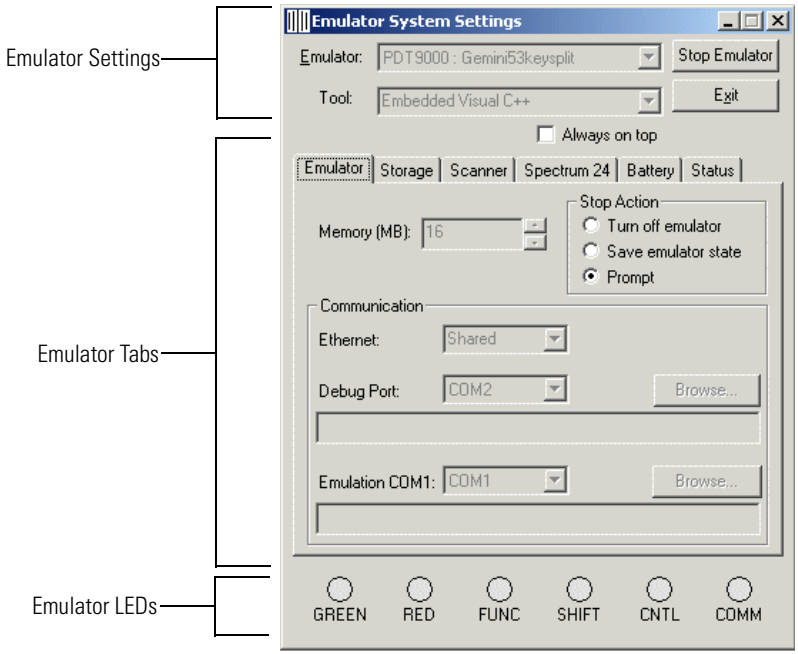


Figure 11-4. Emulator System Settings Window

Table 11-1. Emulator Window Functions

Window	Functions
Emulator System Settings	The *Emulator* drop-down list, used to select either: *PDT9000: Gemini53key* for a full view of the mobile computer. or PDT9000: Gemini53keysplit for a split view of the mobile computer.
	Launch button, starts the emulator.
	Exit button, exits the emulator.
	Tool drop down window displays the selected *Embedded Visual C++* tool.
	*Always on To*p checkbox. Select to keep the Simulator System Settings window on top of other program windows.
Emulator tabs	Provide the *Emulator, Storage, Scanner, Spectrum 24, Battery*, and *Status* parameter settings and display windows.
LED Indicators	Displays the state (selected or not selected) of the indicators: GREEN, REC, FUNC, SHIFT, COMM and POWER.

A detailed discussion of each of the emulator window tabs settings and displays is provided in the following sections:

- Emulator
- Storage
- Scanner
- Spectrum24
- Battery
- Status.

Emulator Tab

Use the *Emulator* tab to set the emulator parameters, memory size, launch options and communications.

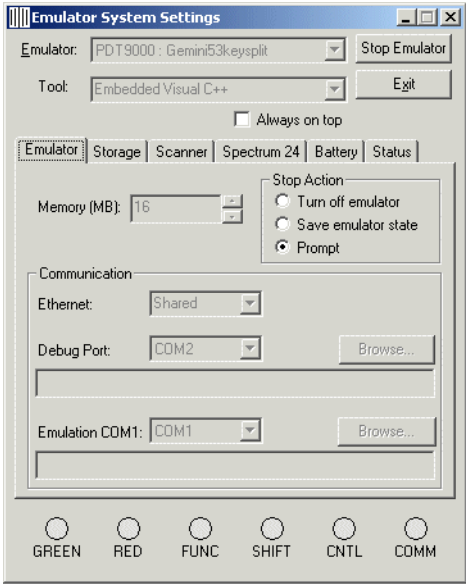


Figure 11-5. Emulator Tab

Table 11-2. Emulator Tab Functions

Setting	Description
Memory	Sets the memory size.
Stop Action	Sets the shut down state:
	Turn off emulator - Exits the emulator program.
	Save emulator state - Returns emulator to the same state when re-launched. Platform, Application and MMC folders are NOT copied to emulator from the desktop hard drive.
	Prompt - Keeps the emulator program running.
Ethernet	Select setting: *None, Shared,* or *VirtualSwitch*.

Table 11-2. Emulator Tab Functions (Continued)

Setting	Description
Debug Port	Select setting: *None*, *Com1*, *Com2*, or *File*.
Emulation COM2	Select setting: *None*, *Com1*, *Com2*, or *File*.

Storage Tab

The Emulator Storage settings simulate the storage environment that would be provided by a flash file system and MMC. When the emulator starts, the contents of these development computer folders are copied to the emulator as separate folders. Once the emulator is running, changes made to the desktop folder are not reflected in the emulator folder until the emulator is stopped and launched again. Changes made in the emulator folder are not reflected in the desktop folder. These files must be captured using remote file viewer.

The emulator *\Application* and *\Platform* storage paths are set when the emulator is started for the first time. The *\SD-MMC* storage path is used to set the SD-MMC path.

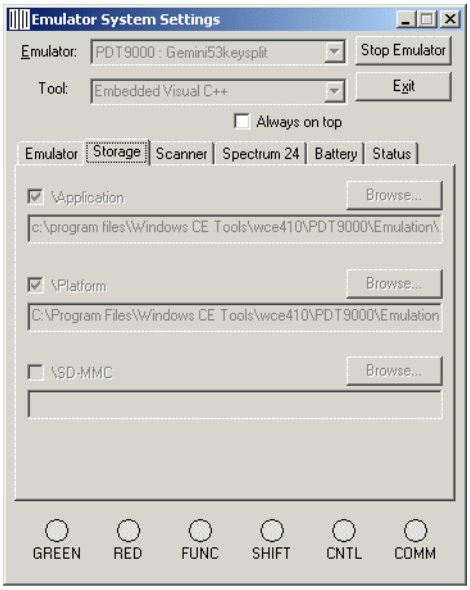


Figure 11-6. Storage Tab

Scanner Tab

Use the *Scanner* tab to allow the user to specify the type of simulated scanning provided by the emulator (the emulator does not have an integrated scanner).

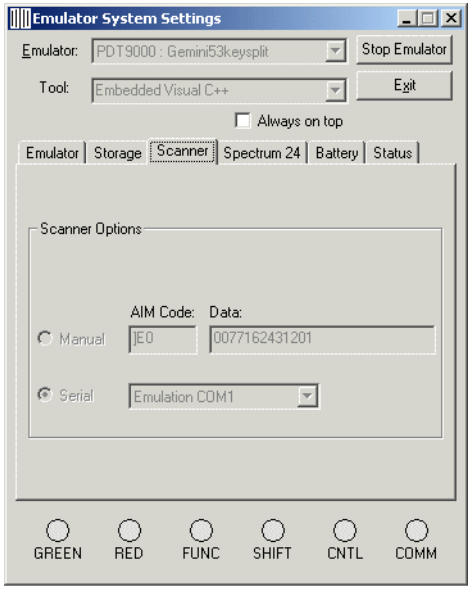


Figure 11-7. Scanner Tab

Table 11-3. Scanner Tab Functions

Setting	Description
Scanner Options, Manual	Enter scan data manually to be returned to the scanner application.
Scanner Options, Serial	Scan data is entered via a serial connection to the specified serial port.

Spectrum24 Tab

Use the *Spectrum24* tab to allow the user to modify the simulated characteristics of the Spectrum24 interface. Both the simulated network card and the access point ESSID2MAC addresses can be modified to simulate a specific network environment.

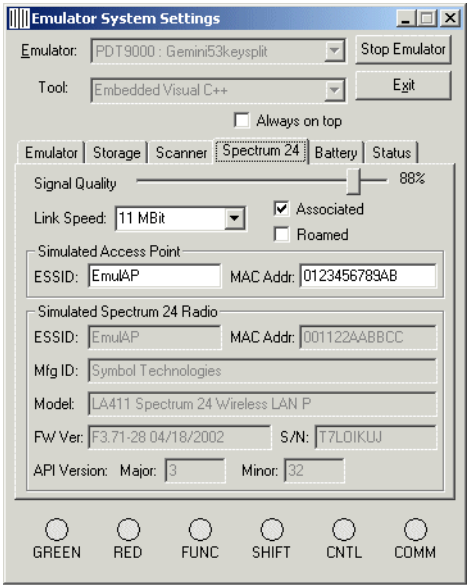


Figure 11-8. Spectrum24 Tab

Table 11-4. S24 Tab Functions

Setting	Function
Signal Quality	Set the slide bar to represent the signal quality to be simulated.
Link Speed	Select the simulated date transfer rate, *1MBit, 2MBit, 5.5MBit* or *11MBit*
Associated and *Roamed*	Select the simulation mode.
Simulated Access Point	Enter the simulated ESSID:
	Enter the simulated MAC Address:

Table 11-4. S24 Tab Functions (Continued)

Setting	Function
Simulated Trilogy Adapter	Enter the simulated *MAC* Address:
	Enter the simulated *Mfg ID:*
	Enter the simulated *Model:*
	Enter the simulated *FW Version:*
	Enter the simulated *Serial #:*

Battery Tab

Use the *Battery* tab to setup the power source to A/C or battery. Battery profiles (life and discharge/charge rate) can also be set. Battery status can be modified using the shell icon or using the Windows CE battery API calls.

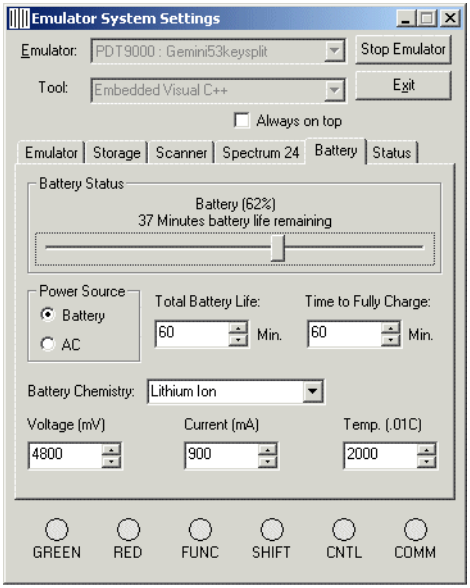


Figure 11-9. Battery Tab

Table 11-5. Battery Tab Functions

Setting	Function
Battery Status	Set the slide bar to represent the simulated remaining battery life.
Power Source	Select to simulate battery or AC power input.
Total Battery Life:	Set to simulate battery life.
Time to Fully Charge:	Set to simulate battery charge time.
Battery Chemistry	Select to simulate battery type: *Alkaline, Nickel Cadmium, Nickel Metal Hydride, Lithium Ion, Lithium Polymer* or *Zinc Air*
Voltage (mV)	Set to simulate battery voltage.
Current (mA)	Set to simulate battery current.
Temp (.01C)	Set to simulate battery temperature.

Status Tab

The *Status* tab provides a visual indication of backlight, contrast and LEDs. Intensities of backlight are indicated by the size of the backlight bar.



The desktop emulator always displays the emulated terminal screen in color. When testing an application targeted for a color terminal, contrast APIs should not be used as they are NOT available on actual color terminals.

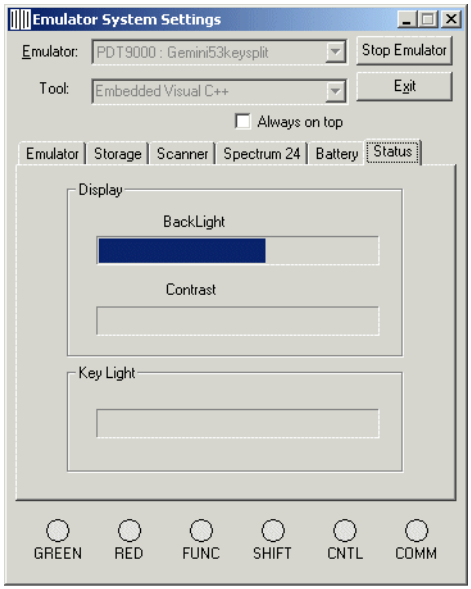


Figure 11-10. Emulator Status Indications

Table 11-6. Status Tab Functions

Setting	Description
Display	*Backlight* - Indicates the BackLight setting.
	Contrast - Indicates the contrast setting.
Key Light	Indicates the Key Light setting.

Using the Emulator

Once the Emulator has been launched and is running it functions like the actual terminal, see *Starting the Emulator on page 11-3*.

User Inputs

The Emulator uses both the development computer mouse and the keypad for user inputs.

Mouse Inputs

The mouse cursor functions as a the stylus functions in the mobile computer. It can be used for selecting items and entering information.

- Click: Right click the mouse once to simulate the stylus screen tap.
- Double-Click: Double click the mouse to simulate the stylus double screen tap. Use double click to execute application software.
- Drag: Drag the mouse simulate the stylus screen drag. Use drag across the screen to select text and images. Drag in a list to select multiple items.

Keypad Inputs

The development computer keypad can also be used for entering data.

Taskbar

The *Taskbar* (at the bottom of the window) displays the **Start** button, active programs (in this case *PC Link* and *Mobile Companion*) battery status and the communication status..

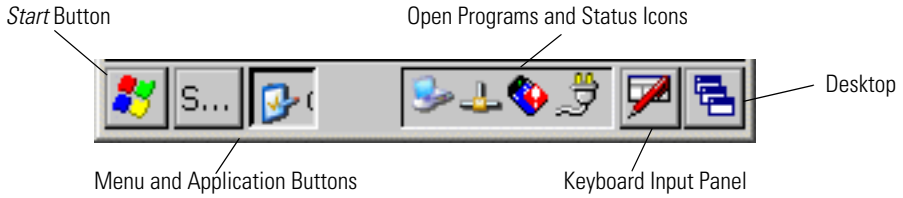


Figure 11-11. Taskbar

Start Button

The **Start** button is used to launch the Start Menu, see *Start Menu on page 11-17*.

AC Power/Battery Status Icons

AC Power/Battery Status icons are shown in the taskbar to indicate present power supply status. They appear and function the same as in the mobile computer, see *AC Power/Battery Status Icons on page 2-30*.

Taskbar Icons and Buttons

The *Taskbar* icons and buttons are displayed in the taskbar. They appear and function the same as in the mobile computer, see *Taskbar Icons on page 2-27* and *Taskbar Buttons on page 2-28*.

Open Programs

If more than program is open, the taskbar icons can be used to toggle between the open programs (applications). Tapping on a icon opens the associated program. These icons only appear if a program is open.

Main Menu

On Emulator power up, the Main Menu window appears and functions the same as in the mobile computer, see *Series 9000 Demo Window on page 2-25*.

Start Menu

On Emulator power up, the Main Menu window appears. The **Start** button functions the same as in the mobile computer, see *Series 9000 Demo Window on page 3-39*.

Exiting the Emulator

The emulator may be exited in one of two ways:

- Press the “Stop Emulation” button on the SSD.
- Press the red Power button and select the “Stop Emulation Button” to turn the emulator off.

In either case two additional exit states are provided:

- Turn off emulator (re-initiate Emulator on next start)

  Copies all files form the desktop flash file system and restarts the emulator.
- Save emulator state (restore previous state on next start)

  Restores the last Emulator state.

To restart the emulator see *Starting the Emulator on page 11-3*.

Resetting the Emulator

The emulator does not support a the reset function. Warm and cold boots cannot be performed on the emulator.

12

Maintenance and Troubleshooting

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Introduction

This chapter includes instructions on cleaning and storing the mobile computer and provides troubleshooting solutions for potential problems during mobile computer operating.

Maintaining the Mobile Computer

For trouble-free service, observe the following tips when using the mobile computer:

- Take care not to scratch the screen of the mobile computer. When working with the mobile computer, use the supplied stylus or plastic-tipped pens intended for use with a touch-sensitive screen. Never use an actual pen or pencil or other sharp object on the surface of the screen.
- Although the mobile computer is water and dust resistant, do not expose it to rain or moisture for an extended period of time.
- The touch-sensitive screen of the mobile computer contains glass. Take care not to drop the mobile computer or subject it to strong impact.
- Protect the mobile computer from temperature extremes. Do not leave it on the dashboard of a car on a hot day and keep it away from heat sources.
- Do not store or use the mobile computer in any location that is extremely dusty, damp or wet.
- Use a soft lens cloth to clean the mobile computer. If the surface of the screen becomes soiled, clean it with a soft cloth moistened with a diluted window-cleaning solution.

Troubleshooting

Table 12-1. Troubleshooting the Mobile Computer

Problem	Cause	Solution
Mobile computer does not turn on.	Lithium-ion battery not charged.	Charge or replace the lithium-ion battery in the mobile computer.
	Lithium-ion battery not installed properly.	Ensure battery is installed properly. See *Main Battery Insertion and Removal on page 1-9*.
	System crash.	Perform a warm boot. If the mobile computer still does not turn on, perform a cold boot. See *Resetting the Mobile Computer on page 2-39*.
Rechargeable lithium-ion battery did not charge.	Battery failed.	Replace battery. If the mobile computer still does not operate, try a warm boot, then a cold boot. See *Resetting the Mobile Computer on page 2-39*.
	Mobile computer removed from cradle while battery was charging.	Insert mobile computer in cradle and begin charging. The lithium-ion battery requires about four hours to recharge fully.
Cannot see characters on display.	Mobile computer not powered on.	Press the Power button.
During data communication, no data was transmitted, or transmitted data was incomplete.	Mobile computer removed from cradle or unplugged from host computer during communication.	Replace the mobile computer in the cradle, or reattach the Synchronization cable and re-transmit.
	Incorrect cable configuration.	See the System Administrator.
	Communication software was incorrectly installed or configured.	Perform setup. See *Chapter 4, Communications* for details.
No sound is audible.	Volume setting is low or turned off.	Unit may be a beeper only unit or incorrect Config Block is programmed into device.

Table 12-1. Troubleshooting the Mobile Computer (Continued)

Problem	Cause	Solution
Mobile computer turns itself off.	Mobile computer is inactive.	The mobile computer turns off after a period of inactivity. If the mobile computer is running on battery power, this period can be set from 1 to 5 minutes, in one-minute intervals. If the mobile computer is running on external power, this period can be set to 1, 2, 5, 10, 15 and 30 minutes.
	Battery is depleted.	Replace the battery.
	Battery is not inserted properly.	Insert the battery properly, see *Figure 1-4 on page 1-9*.
Tapping the window buttons or icons does not activate the corresponding feature.	LCD screen not aligned correctly.	Re-calibrate the screen. See *Figure on page 1-18*.
	The system is hung.	Warm boot the system. To perform a warm boot, see *Resetting the Mobile Computer on page 2-39*.
A message appears stating that the mobile computer memory is full.	Too many files stored on the mobile computer.	Delete unused memos and records. Save these records on the host computer.
	Too many applications installed on the mobile computer.	

Table 12-1. Troubleshooting the Mobile Computer (Continued)

Problem	Cause	Solution
The mobile computer does not accept scan input.	Scanning application is not loaded.	Verify that the unit is loaded with a scanning application. See the System Administrator.
	Unreadable bar code.	Ensure the symbol is not defaced.
	Distance between exit window and bar code is incorrect.	Ensure mobile computer is within proper scanning range.
	Mobile computer is not programmed for the bar code.	Ensure the mobile computer is programmed to accept the type of bar code being scanned.
	Mobile computer is not programmed to generate a beep.	If a beep on a good decode is expected and a beep is not heard, check that the application is set to generate a beep on good decode.
	Battery is low.	If the scanner stops emitting a laser beam when the scan button is pressed, check the battery level. When the battery is low, the scanner shuts off before the mobile computer low battery condition notification. Note: If the scanner is still not reading symbols, contact the distributor or Symbol Technologies.



If, after performing these checks, the mobile computer is still not reading symbols, contact the distributor or Symbol Technologies.

Four Slot Charge Only Cradle

Table 12-2. Troubleshooting the Four Slot Charge Only Cradle

Problem	Cause	Solution
Mobile computer charge indicator LED does not light.	Cradle is not receiving power.	Ensure the power supply is securely connected and receiving power.
	Mobile computer is not seated correctly in the cradle.	Ensure the battery is properly installed in the mobile computer, and re-seat the mobile computer in the cradle.
	The battery is not properly installed in the mobile computer.	
	The battery in the mobile computer is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
Note: The Four Slot Charge Only Cradle has no power indication.		

Four Slot Ethernet Cradle

Table 12-3. Troubleshooting the Four Slot Ethernet Cradle

Symptom	Cause	Solution
Attempt by the mobile computer to ActiveSync failed.	Mobile computer removed from the cradle while the LED was blinking green.	Wait one minute and reinsert the mobile computer in the cradle. This allows the cradle to attempt another synchronization.
	ActiveSync on the host computer has not yet closed the previous ActiveSync session.	Wait one minute and reinsert the mobile computer in the cradle. This allows the cradle to attempt another synchronization.
	Incorrect cable configuration.	Check your DHCP server and determine which IP address was allocated to the cradle, then check connectivity by pinging the cradle.
	Communications software improperly configured.	Perform setup as described in *Chapter 4, Communications*. Check your DHCP server and determine which IP address was allocated to the mobile computer slot, then check connectivity by pinging the cradle.
	Mobile computer ActiveSync disabled or not configured to accept network connection.	On the mobile computer, tap *Start* - *ActiveSync* - *Tools* - *Options* - **Options** button. Then, uncheck the *Enable PC sync using this connection:* check box.
	Host ActiveSync disabled or not configured to accept network connection.	On the mobile computer, tap *Start* - *Settings* and double tap the *Network and Dial-up Connections* icon. Edit an existing connection or create a new connection that is configured to accept the network connection.
During communications, no data was transmitted, or transmitted data was incomplete.	Mobile computer removed from cradle during communications.	Replace mobile computer in cradle and retransmit.
	Mobile computer has no active connection.	An icon will be visible in the status bar if a connection is currently active.
Mobile computer has successfully connected through the cradle, but no data is being transmitted over the connection.	Data is being transferred over the S24 radio link.	Temporarily disable the radio link to force data transmission through the cradle. Tap the wireless LAN icon and tap WLAN Profiles from the menu. Tap the *Mode* tab. Enter an in-valid value in the *ESSID:* text box and tap the OK button. Verify that the radio link has been disabled. Once the data transmission has been completed, re-enable the radio link.

Table 12-3. Troubleshooting the Four Slot Ethernet Cradle (Continued)

Symptom	Cause	Solution
All Communication Status LEDs are flashing red.	The unit could not configure itself, or it has lost the lease on its IP address.	Connect the unit to an Ethernet network with a correctly functioning DHCP server.
	Failed automatic cradle configuration via local DHCP service.	Connect a properly configured DHCP server or DHCP relay agent to the subnet, and power cycle the cradle. Check the DHCP server log to verify that the cradle is receiving a response to its DHCP request.
	The Ethernet link may be down.	Ensure the ethernet cable is connected to an active hub.
Communication Status LED does not light up.	Mobile computer has been inserted incorrectly into the cradle.	Remove, wait a minute, and then reinsert the mobile computer, ensuring it fits snugly onto the connector at the bottom of the cradle.
	Cradle is not receiving power.	Ensure the power supply is securely connected and receiving power.
Battery is not recharging.	Mobile computer removed from the cradle too soon.	Replace the mobile computer into the cradle. It can take up to 4 hours to recharge a completely depleted battery pack if mobile computer is suspended or longer if the mobile computer is on. Tap *Start - Settings - System - Power* to view battery status.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	Mobile computer is not inserted correctly into the cradle.	Remove the mobile computer and reinsert it correctly. Verify charging is active. Tap *Start - Settings - System - Power* to view battery status.
Warning Message - "! Unable to obtain a server assigned IP address. Try again later or enter an IP address in Network Settings."	This message occurs if a suspend/resume cycle is performed and the mobile computer radio is not associated (e.g. due to being out of range)	Tap OK to close the message. The mobile computer will obtain address information and communicate through the ethernet cradle.

Four Slot Spare Battery Charger

Table 12-4. Troubleshooting The Four Slot Spare Battery Charger

Symptom	Possible Cause	Action
Batteries not charging.	Battery was removed from the charger or charger was unplugged from AC power too soon.	Ensure MSR is receiving power. Ensure mobile computer is attached correctly. Confirm main battery is charging under *Start - Settings - System - Power.* If a mobile computer battery is fully depleted, it can take up to four hours to fully recharge a battery (if the mobile computer is off and longer if the mobile computer is operating).
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	Battery contacts not connected to charger.	Verify that the battery is seated in the battery well correctly with the contacts facing down.

Single Slot Serial/USB Cradle

Table 12-5. Troubleshooting the Single Slot Serial/USB Cradle

Symptom	Possible Cause	Action
LEDs do not light when mobile computer or spare battery is inserted.	Cradle is not receiving power.	Ensure the power cable is connected securely to both the cradle and to AC power.
	Mobile computer is not seated firmly in the cradle.	Remove and re-insert the mobile computer into the cradle, ensuring it is firmly seated.
	Spare battery is not seated firmly in the cradle.	Remove and re-insert the spare battery into the charging slot, ensuring it is firmly seated.
Mobile computer battery is not charging.	Mobile computer was removed from cradle or cradle was unplugged from AC power too soon.	Ensure cradle is receiving power. Ensure mobile computer is seated correctly. Confirm main battery is charging under *Start - Settings - System - Power.* If a mobile computer battery is fully depleted, it can take up to four hours to fully recharge a battery (if the mobile computer is off and longer if the mobile computer is operating).
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The mobile computer is not fully seated in the cradle.	Remove and re-insert the mobile computer into the cradle, ensuring it is firmly seated.

Table 12-5. Troubleshooting the Single Slot Serial/USB Cradle (Continued)

Symptom	Possible Cause	Action
Spare battery is not charging.	Battery not fully seated in charging slot.	Remove and re-insert the spare battery into the cradle, ensuring it is firmly seated.
	Battery inserted incorrectly.	Ensure the contacts are facing down and toward the back of the cradle.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
During data communications, no data was transmitted, or transmitted data was incomplete.	Mobile computer removed from cradle during communications.	Replace mobile computer in cradle and retransmit.
	Incorrect cable configuration.	See your system administrator.
	Communications software is not installed or configured properly.	Perform setup as described in *Communication Setup on page 4-9*.

Cable Adapter Module

Table 12-6. Troubleshooting The Cable Adapter Module

Symptom	Possible Cause	Action
Mobile computer battery is not charging.	Mobile computer was removed from CAM or CAM was unplugged from AC power too soon.	Ensure CAM is receiving power. Ensure mobile computer is attached correctly. Confirm main battery is charging under *Start - Settings - System - Power*. If a mobile computer battery is fully depleted, it can take up to four hours to fully recharge a battery (if the mobile computer is off and longer if the mobile computer is operating).
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The mobile computer is not fully attached to the CAM.	Detach and re-attach the CAM to the mobile computer, ensuring it is firmly connected.
During data communications, no data was transmitted, or transmitted data was incomplete.	Mobile computer detached from CAM during communications.	Re-attach mobile computer to CAM and retransmit.
	Incorrect cable configuration.	See your System Administrator.
	Communications software is not installed or configured properly.	Perform setup as described in *Chapter 4, Communications*.

Magnetic Stripe Reader

Table 12-7. Troubleshooting the Magnetic Stripe Reader

Symptom	Possible Cause	Action
MSR cannot read card.	Mobile computer detached from MSR during card swipe.	Re-attach mobile computer to MSR and reswipe the card.
	Faulty magnetic stripe on card.	See your System Administrator.
	MSR application is not installed or configured properly.	Ensure the MSR application is installed on the mobile computer. Ensure the MSR application is configured correctly.

Table 12-7. Troubleshooting the Magnetic Stripe Reader (Continued)

Symptom	Possible Cause	Action
Mobile computer battery is not charging.	Mobile computer was removed from MSR or MSR was unplugged from AC power too soon.	Ensure MSR is receiving power. Ensure mobile computer is attached correctly. Confirm main battery is charging under *Start - Settings - System - Power*. If a mobile computer battery is fully depleted, it can take up to four hours to fully recharge a battery (if the mobile computer is off and longer if the mobile computer is operating).
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The mobile computer is not fully attached to the MSR.	Detach and re-attach the MSR to the mobile computer, ensuring it is firmly connected.
During data communications, no data was transmitted, or transmitted data was incomplete.	Mobile computer detached from MSR during communications.	Reattach mobile computer to MSR and retransmit.
	Incorrect cable configuration.	See your System Administrator.
	Communications software is not installed or configured properly.	Perform setup as described in *Chapter 4, Communications*.

MDM9000 Modem Module

Table 12-8. Troubleshooting the MDM9000 Modem Module

Symptom	Possible Cause	Action
Mobile computer is not communicating through the modem.	The modem cable is not fully connected.	Connect the modem cable securely to both the modem and the telephone jack.
	Modem is not securely connected to the mobile computer.	Reconnect the modem to the mobile computer.
	Communication software is not installed or configured properly.	Set up the communication software.
	Problem in the telephone lines.	Connect a conventional telephone and dial the remote modem to verify the telephone lines are functioning. If the remote modem does not answer the call and emit answering tones, contact the remote System Administrator.
	Mobile computer's battery is low or discharged, which shuts off power to the modem.	Install a charged battery in the MC9000, or use an external DC power adapter to recharge the battery.
ActiveSync fails.	A partnership was not established with the host computer.	Establish a partnership with the host computer.
	Host computer is not selected in the *ActiveSync* window on the mobile computer.	Select a host computer in the *ActiveSync* window, and perform setup.
	Modem RAS connection not allowed by host computer.	Select RAS connection in the host computer *(File - Connection Settings* window). Refer to the ReadMe files located in the Microsoft ActiveSync folder on the host computer.
	Mobile computer or modem was disconnected from the telephone line while ActiveSync was in progress.	Disconnect the modem cable for 30 seconds to hang up the local telephone connection. Close any open windows on the mobile computer and any modem connections.
	Synchronization occurred, but the session is configured to close immediately after synchronization is complete.	Verify the *synchronizing* setting.

Table 12-8. Troubleshooting the MDM9000 Modem Module (Continued)

Symptom	Possible Cause	Action
Dial-out fails	Location setting is incorrect.	Verify Dialing Locations. Verify Dialing Patterns are correct for the current location. For example, enter 'G' in the *For local calls, dial:* field to dial directly, or '9,G' if the telephone system requires dialing '9' first to access an outside line.
	Incorrect server phone number.	Verify the connection phone number in the *Connecting* window.
	Pulse dialing not supported for country.	Use a connection within a tone-dialing system.
Dial-out fails *continued...*	Dialtone detection not supported.	The service you subscribe to (e.g., a remote answering service) may use a different type of dialtone. Disable dialtone detection on the modem by entering the initialization string "ATX0" in the *Extra dial-string modem commands:* text box of the *Modem Settings* window.
	The following error message appears: Trouble Connecting: There is no answer at the number dialed. Verify the phone...'	The modem may be required to be powered before opening the port for dial-out.
	The Connection Manager routes are incorrect.	Warm boot the mobile computer and confirm the connection settings.

VCD9000 Vehicle Cradle

Table 12-9. Troubleshooting the VCD9000 Vehicle Cradle

Symptom	Possible Cause	Action
Mobile computer battery charging LED does not light.	Cradle is not receiving power.	Ensure the power input cable is securely connected to the cradle's power port.
Mobile computer's battery is not recharging.	Mobile computer was removed from the cradle too soon.	Replace the mobile computer in the cradle. If the mobile computer's battery pack is fully depleted, it can take four hours to fully recharge the battery.
	Battery is faulty.	Replace the battery.
	Mobile computer was not placed correctly in the cradle.	Remove the mobile computer from the cradle, and re-insert correctly. If the battery still does not charge, contact Customer Support. The mobile computer battery charging LED blinks amber when the mobile computer is correctly inserted and is charging.
No data was transmitted, or transmitted data was incomplete.	Mobile computer was removed from the cradle during communication.	Replace the mobile computer in the cradle and retransmit.
	The external device required a null modem cable, which was not used.	Retransmit using a null modem cable.
	Incorrect cable configuration.	See the system administrator.

A

Technical Specifications

Appendix Contents

Mobile Computer Technical Specifications A-3
MDM9000 Modem Module Technical Specifications A-5
Mobile Computer Pin-Outs A-7
Accessory CAM and MSR Pin-Outs A-8

Mobile Computer Technical Specifications

The following table summarizes the mobile computer's intended operating environment.

Table A-1. Mobile Computer Technical Specifications

Operating Temperature	-4° to 122° F (-20° to +50° C)
Storage Temperature	-40° to 158° F (-40° to 70° C)
Humidity	5% to 90% non-condensing
Electrostatic Discharge (ESD)	+/-15 kVDC (air); +/- 8 kVDC (contact)
Drop to Concrete	6 feet (1.8 meters) at 14° to 122° F (-10°C to 50°C) 5 feet (1.52 meters) at 14°F to -4° F (-10°C to -20°C)
Sealing	IP64 (electronic enclosure)
Dimensions	MC9000-K: 9.2 in. L x 3.6 in. W x 2.3 in. H (233.7 mm L x x 91.4 mm W x 58.4 mm H) MC9000-S: 8 in. L x 3.6 in. W x 2.3 in. H (203.2 mm L x x 91.4 mm W x 58.4 mm H)
Weight (including battery)	MC9000-K: 24 oz - 25 oz (680 g - 708.8 g) MC9000-S: 23 oz - 24 oz (652 g - 680 g)
Display	Transflective color TFT-LCD, 65K colors, 240 (W) x 320 (L) (QVGA size) Monochrome TFT-LCD, 16 shades, 240 (W) x 320 (L) (QVGA size)
Touch Panel	Polycarbonate, analog resistive touch
Main Battery	MC9000-K: Rechargeable Lithium-Ion 2200 mAh minimum (7.4V) MC9000-S: Rechargeable Lithium-Ion 1550 mAh minimum (7.4V)
Backup Battery	Ni-MH battery (rechargeable), 20mAh (3.6V) 3 cells
CPU	Intel® XScale™ PXA255 processor at 400 mHz
Operating Platform	Microsoft® Embedded Windows® CE 4.1 (CE .NET)
Memory	32MB RAM/ 32MB Flash 64MB RAM/ 64MB Flash

Table A-1. Mobile Computer Technical Specifications (Continued)

Interface	RS-232, max. 115.2 kbps min. 1200bps, USB
MMC Card Slot	Type II
Keypad Options	MC9000-K: 53-key standard Optional Keypads: • 28-key • 43-key MC9000-S: 28-key standard
Data Capture:	
1D Decode Capability	Code 39, code 128, code 93, codabar, code 11, discrete 2 of 5, EAN-3, EAN-13, EAN-128, interleaved 2 of 5, TLC39 (telecommunications, UPCA, UPCE and UPC/EAN supplements.
Imaging Decode Capability	Code 39, code 128, code 93, codabar, code 11, discrete 2 of 5, EAN-3, EAN-13, EAN-128, interleaved 2 of 5, TLC39 (telecommunications, UPCA, UPCE, UPC/EAN supplements composite code (retail), coupon code (retail), macro PDF-417, (macro) micro PDF-417 (T&L), micro PDF-417 (telecommunications), MSI Plessey, PDF-417 (automotive), RSS expanded, RSS limited and RSS-14Maxi Code (UPS), Data matrix (electronics industry, US Postnet (USPS)*, US Planet (USPS), UK 4-state, Australian 4-state, Canadian 4-state, Japanese 4-state, Dutch Kix *To be supported at a later date. Go to http://software.symbol.com/ for a list of the latest supported symbologies.

MDM9000 Modem Module Technical Specifications

Table A-2. MDM9000 Modem Module Technical Specifications

Asynchronous character format	Up to 10 bits, including data, start, stop, and parity bits
Asynchronous data rates	Transmission rate fallback through 300 bps
Chipset	Conexant SCM
Compatible public switched network jacks	RJ11
Dialing capability	Tone and rotary pulse
Line requirements	Public switched telephone network (PSTN) including international connections
Operating environment	Altitude: up to 20,000 ft. Humidity: 10% to 90% non-condensing
Operating temperature	Operating: 32^{o} to 122^{o}F / 0^{o} to 50^{o}C Storage: -4^{o} to 149^{o}F / -20^{o} to 65^{o}C
Operating modes	Asynchronous, full duplex, automatic and manual call originate
Performance	Line speed up to 33,600 bps HHC to modem speed (DTE speed) up to 57,600 bps V.42bis data compression V.42 LAPM error correction
Current consumption	100 mA active <10 mA sleep
Pulse dialing rate (except where prohibited under TBR-21 rules)	10 pulses per second Pulse dialing duty cycle: 39/61% (US) make-to-break ratio
Ringer equivalence	0.1 dBm
Standards & protocols	Bell 103, Bell 212A, Hayes AT command set, and ITU Vs. 17, 21, 22 A & B, 22bis, 23, 25bis, 27 ter, 29, 32, 32bis, 42bis
Tone detected	Dial, busy, ring back, modem answer tones. Blind dialing based on time-out periods available for incompatible tones.
AC Adapter	9V, 2 amp regulated AC/DC adapter allows unlimited modem use. Do NOT substitute an AC adapter; using an incorrect AC power supply causes electrical damage to the mobile computer and voids warranty.

Mobile Computer Pin-Outs

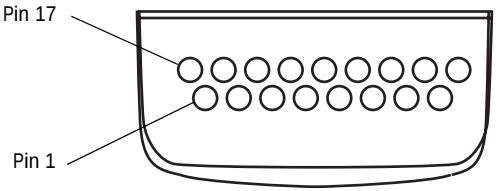


Figure A-1. Pin Locations

Table A-3. MC9000-K and MC9000-S, Pin-Outs

PIN Number	Signal Name	Function
1	USB_GND	USB
2	USB_D_PLUS	USB
3	TXD	RS232C
4	RXD	RS232C
5	DCD	RS232C
6	RTS	RS232C
7	DSR	RS232C
8	GND	Ground, 2.5A max.
9	RI	RS232C
10	CRADLE_DET	Grounded by cradle when in cradle
11	DTR	RS232C
(12) Opended	NC (not connected)	NC
13	POWER_IN	12V, 2.5A max
14	CTS	RS232C
15	USB_5V_DET	USB
16	USB_D_MINUS	USB
17	EXT_PWR_OUT	3.3V @500mA max

Accessory CAM and MSR Pin-Outs

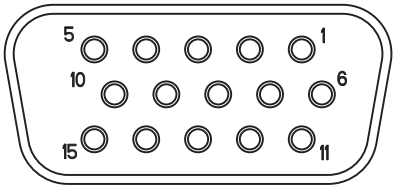


Figure A-2. CAM and MSR Serial Connector

Table A-4. CAM and MSR Serial Connector Pinouts

Pin	Signal
1	USB_5V_DET
2	USB_D_MINUS
3	USB_D_PLUS
4	GND
5	GND
6	PWR_EXT_OUT
7	CRADLE_DET*
8	DSR
9	DCD
10	TXD
11	CTS
12	DTR
13	RI
14	RTS
15	RXD

B

Keypad Maps

Appendix Contents

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- 43-Key Keypad (MC9000-K) B-25
- 53-Key Keypad (MC9000-K) B-36
- 3270 Emulator B-46
- 5250 Emulator B-54
- VT Emulator Keypad B-62
- 28-Key Keypad (MC9000-S) B-72

Introduction

This appendix contains the keypad maps for the keypad configurations. Each key is listed in the table with its value, depending on the state of the keypad.

Keypads

Each of the MC9000-K and MC9000-S mobile computers have interchangeable modular Keypads:

- 28-key Keypad (MC9000-K)
- 43-key Keypad (MC9000-K)
- 53-key Keypad (MC9000-K)
- 3270 Emulator (MC9000-K)
- 5250 Emulator (MC9000-K)
- VT Emulator (MC9000-K)
- 28-key Keypad (MC9000-S).

The modular keypads can be changed in the field as necessary to support specialized applications.

28-Key Keypad (MC9000-K)

The 28-key keypad contains a Power button, application keys, scroll keys and a function key. See Table B-3 for key functions and Table B-4 for the keypad mappings. The mapping functions include:

- 28-key functions
- 28-key character map.

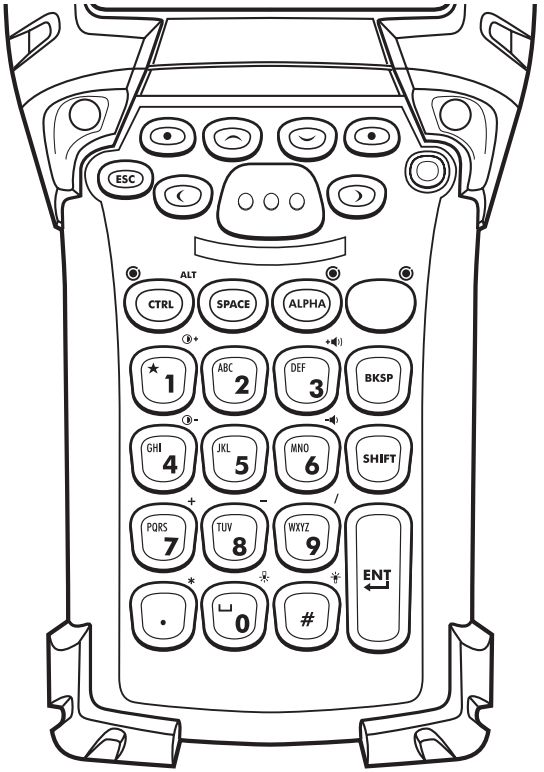


Figure B-1. MC9000-K: 28-Key Keypad

Table B-1. MC9000-K: 28-Key Functions

Local Function	Key Sequence
Display Backlight On/Off	<Func><#>
Keypad Backlight On/Off	<Func><0>
Contrast +	<Func><1>
Contrast -	<Func><4>
Volume +	<Func><3>
Volume -	<Func><6>

Table B-2. MC9000-K: 28 Key Keypad Mapping

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	1												49	49
		*											106	42
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	2												50	50
		a											65	97
			b										66	98
				c									67	99
						A							160+65	65
							B						160+66	66
								C					160+67	67

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	3												51	51
		d											68	100
			e										69	101
				f									70	102
						D							160+68	68
							E						160+69	69
								F					160+70	70
											+  *			
												+  *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	4												52	52
		g											71	103
			h										72	104
				i									73	105
						G							160+71	71
							H						160+72	72
								I					160+73	73
											 *			
												 *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	5												53	53
		j											74	106
			k										75	107
				l									76	108
						J							160+74	74
							K						160+75	75
								L					160+76	76
										5			53	53
											=		187	61
												+	160+187	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	6												54	54
		m											77	109
			n										78	110
				o									79	111
						M							160+77	77
							N						160+78	78
								O					160+79	79
											 *			
												 *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	7												55	55
		p											80	112
			q										81	113
				r									82	114
					s								83	115
						P							160+80	80
							Q						160+81	81
								R					160+82	82
									S				160+83	83
											+		107	43
												+	160+107	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	8												56	56
		t											84	116
			u										85	117
				v									86	118
						T							160+84	84
							U						160+85	85
								V					160+86	86
											-		189	45
												-	160+189	45

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	9												57	57
		w											87	119
			x										88	120
				y									89	121
					z								90	122
						W							160+87	87
							X						160+88	88
								Y					160+89	89
									Z				160+90	90
											/		191	47
												/	160+191	47

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	.												190	46
											*		106	42
												*	160+106	42

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

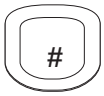
Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	0												48	48
		Space											32	32
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	#												160+51	35
											 *			
												 *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Space												32	32

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	BKSP												8	8

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Up												38	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Down												40	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Right												39	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-2. MC9000-K: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Left												37	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

43-Key Keypad (MC9000-K)

The 43-key keypad contains a Power button, application keys, scroll keys and a function key. See Table B-3 for key functions and Table B-4 for the keypad mappings. The mapping functions include:

- 43-key functions
- 43-key character map.

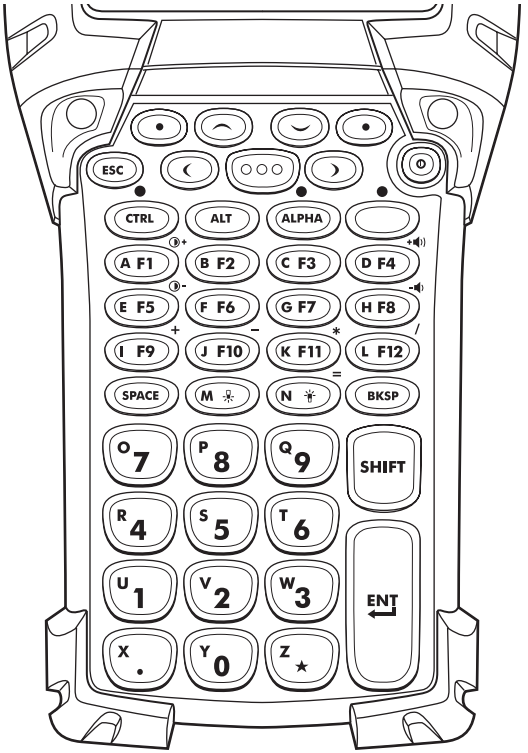


Figure B-2. MC9000-K: 43-Key Keypad

Table B-3. MC9000-K: 43-Key Functions

Local Function	Key Sequence
Display Backlight On/Off	
Keypad Backlight On/Off	
Contrast +	<Func><F1>
Contrast -	<Func><F5>
Volume +	<Func><F4>
Volume -	<Func><F8>

Table B-4. MC9000-K: 43 Keypad Mapping

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	1					49	49
		u				85	117
			U			160+85	85
				u		85	117
					U	160+85	85
	2					50	50
		v				86	118
			V			160+86	86
				v		86	118
					V	160+86	86
	3					51	51
		w				87	119
			W			160+87	87
				w		87	119
					W	160+87	87
	4					52	52
		r				82	114
			R			160+82	82
				r		82	114
					R	160+82	82

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	5					53	53
		s				83	115
			S			160+83	83
				s		83	115
					S	160+83	83
	6					54	54
		t				84	116
			T			160+84	84
				t		84	116
					T	160+84	84
	7					55	55
		o				79	111
			O			160+79	79
				o		79	111
					O	160+79	79
	8					56	56
		p				80	112
			P			160+80	80
				p		80	112
					P	160+80	80

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	9					57	57
		q				81	113
			Q			160+81	81
				q		81	113
					Q	160+81	81
	0					49	49
		y				89	121
			Y			160+89	89
				y		89	121
					Y	160+89	89
	F1						
		a				65	97
			A			160+65	65
				 *			
					 *		
	F2						
		b				66	98
			B			160+66	66
				b		66	98
					B	160+66	66

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
C F3	F3						
		c				67	99
			C			160+67	67
				c		67	99
					C	160+67	67
D F4	F4						
		d				68	100
			D			160+68	68
				+ 🔊 *			
					+ 🔊 *		
E F5	F5						
		e				69	101
			E			160+69	69
				◑ + *			
					◑ + *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	F6						
		f				70	102
			F			160+70	70
				f		70	102
					F	160+70	70
	F7						
		g				71	103
			G			160+71	71
				g		71	103
					G	160+71	71
	F8						
		h				72	104
			H			160+72	72
				h		72	104
					H	160+72	72
	F9						
		i				73	105
			I			160+73	73
				+		107	43
					+	160+107	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
J F10	F10						
		j				74	106
			J			160+74	74
				-		189	45
					-	160+189	45
K F11	F11						
		k				75	107
			K			160+75	75
				*		106	42
					*	160+106	42
L F12	F12						
		l				76	108
			L			160+76	76
				/		191	47
					?	160+191	63
M	*						
		m				77	109
			M			160+77	77
				m		77	109
					M	160+77	77

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	 *						
		n				78	110
			N			160+78	78
				n		78	110
					N	160+78	78
	Space					32	32
		Space				32	32
			Space			160+32	32
	BKSP					8	8
		BKSP				8	8
			BKSP			160+8	8
				BKSP		8	8
	UP					38	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Down					40	-
	Right					39	-
	Left					37	-
	.					190	46
		x				88	120
			X			160+88	88
				x		88	120
					X	160+88	88

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-4. MC9000-K: 43 Keypad Mapping (Continued)

Key	Default (Numlock) State	Alpha State	Shift AlphaState	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	*					106	42
		z				90	122
			Z			160+90	90
				z		90	122
					Z	160+90	90

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

53-Key Keypad (MC9000-K)

There are two physical configurations of the 53-key keypad, however both of the keypads are functionally identical. The 53-key keypad contains a Power button, application keys, scroll keys and function keys. See Table B-5 for key functions and Table B-6 for the keypad mappings. The mapping functions include:

- 53-key functions

53-key character map.

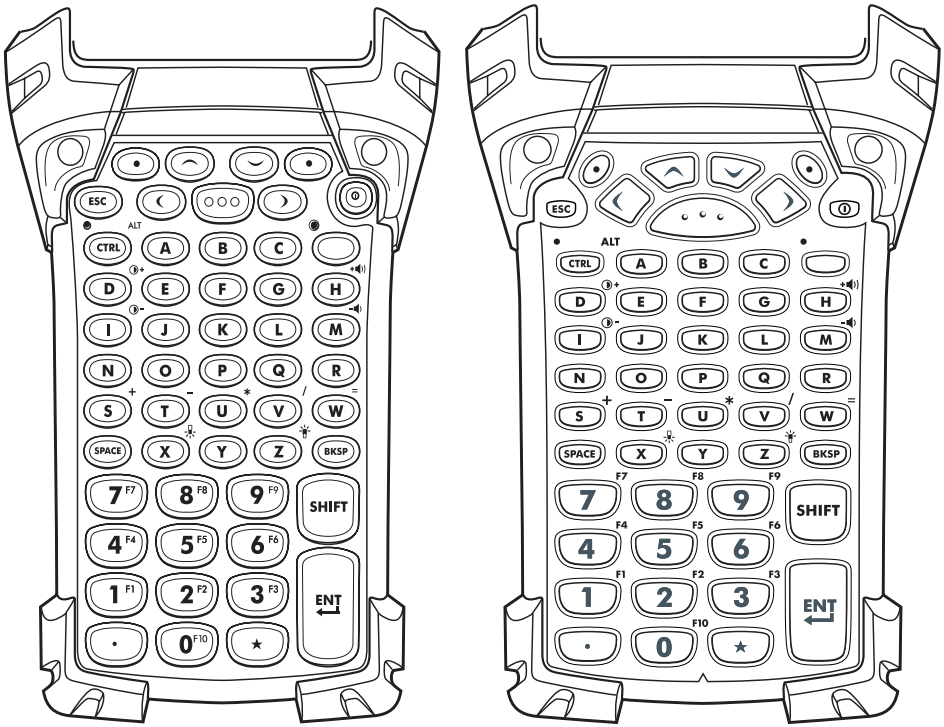


Figure B-3. MC9000-K: 53 Key Keypad

Table B-5. MC9000-K: 53 Key Functions

Local Function	Key Sequence
Display Backlight On/Off	<Func><Z>
Keypad Backlight On/Off	<Func><X>
Contrast +	<Func><D>
Contrast -	<Func><I>
Volume +	<Func><H>
Volume -	<Func><M>

Table B-6. MC9000-K: 53-Key Mapping

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	1				49	49
		!			160+49	33
			F1		112	-
				F1	1160+12	-
	2				50	50
		@			160+50	64
			F2		113	-
				F2	160+113	-
	3				51	51
		#			160+51	35
			F3		114	-
				F3	160+114	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
4	4				52	52
		$			160+52	103
			F4		115	-
				F4	160+115	-
5	5				53	53
		%			160+53	106
			F5		116	-
				F5	160+116	-
6	6				54	54
		^			160+54	94
			F6		117	-
				F6	160+117	-
7	7				55	55
		&			160+55	112
			F7		118	-
				F7	160+118	-
8	8				56	56
		*			160+56	42
			F8		119	-
				F8	160+119	-
9	9				57	57
		(			160+57	41
			F9		120	-
				F9	160+120	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	0				48	48
		)			160+48	40
			F10		121	-
				F10	160+121	-
	UP				38	-
	Down				40	-
	Right				39	-
	Left				37	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	ENTER				13	13
	a				65	97
		A			160+65	65
			,		188	44
				<	160+188	60
	b				66	98
		B			66	66
			.		190	46
				>	160+190	60
	c				67	99
		C			160+67	67
			‘		222	39
				“	160+222	34
	b				68	100
		D			160+68	68
			+ *			
				+ *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
E	e				69	101
		E			160+69	69
			[		219	91
				{	160+219	123
F	f				70	102
		F			160+70	70
			]		221	93
				}	160+221	125
G	g				71	103
		G			160+71	71
			\		220	92
				|	160+220	124
H	h				72	104
		H			160+72	72
			+ *			
				+ *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	i				73	105
		I			160+73	73
			- *			
				- *		
	j				74	106
		J			160+74	74
			'		192	96
				~	160+192	126
	k				75	107
		K			160+75	75
			k		75	107
				K	160+75	75
	l				76	108
		L			160+76	76
			/		191	47
				?	160+191	63

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
M	m				77	109
		M			160+77	77
			*			
				*		
N	n				78	110
		N			160+78	78
			-		189	45
				_	160+189	95
O	o				79	111
		O			160+79	79
			o		79	111
				O	160+79	79
P	p				80	112
		P			160+80	80
			p		80	112
				P	160+80	80
Q	q				81	113
		Q			160+81	81
			q		81	113
				Q	160+81	81

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
R	r				82	114
		R			160+82	82
			;		186	59
				:	160+186	58
S	s				83	115
		S			160+83	83
			+		187	43
				+	160+187	43
T	t				84	116
		T			160+84	84
			-		109	45
				-	160+109	45
U	u				85	117
		U			85	85
			*		106	42
				*	160+106	42
V	v				86	118
		V			160+86	86
			/		191	47
				?	160+191	63
W	w				87	119
		W			160+87	87
			=		187	43
				+	160+187	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-6. MC9000-K: 53-Key Mapping (Continued)

Key	Default State	Shift State	Func State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
X	x				88	120
		X			160+88	88
			*			
				*		
Y	y				89	121
		Y			160+89	89
			y		89	121
				Y	160+89	89
Z	z				90	122
		Z			90	90
			*			
				*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

3270 Emulator

The 3270 emulator keypad contains a Power button, application keys, scroll keys and a function key. The 3270 emulator keypad uses the 53-key mapping when not in the emulator mode, see Table B-6 for descriptions for the 53-key mappings. The emulator mapping functions include:

- 3270 key functions
- 3270 emulation keys
- 3270 character map.

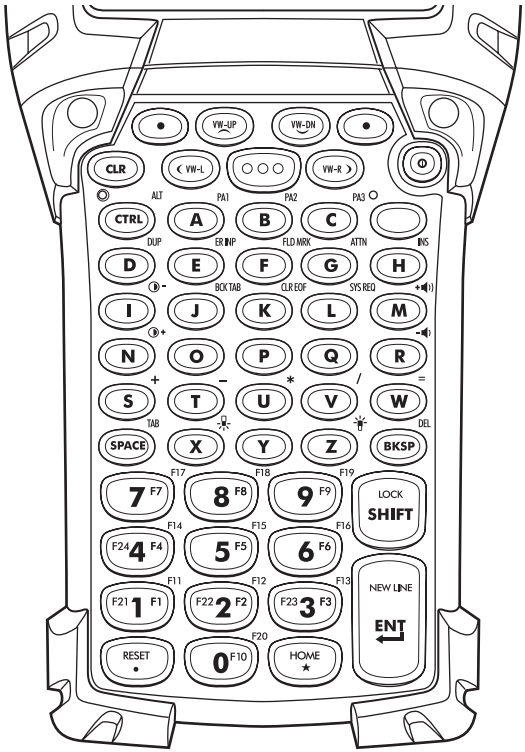


Figure B-4. 3270 Emulator Keypad

Table B-7. 3270 Key Functions

Local Function	**Key Sequence**
Program Information	<Func><Ctrl><P>
Diagnostics	<Func><Ctrl><D>
Keyclicks On/Off	<Func><Ctrl><K>
Quiet Mode On/Off	<Func><Ctrl><Q>
Terminal Configuration	<Func><Ctrl><C>
Host Profiles	<Func><Ctrl><R>
Message Recall	<Func><Ctrl><M>
Free Cursor Mode	<Func><Ctrl><F>
Close Session	<Func><Ctrl><T>
Previous Session	<Upper Left Button>
Next Session	<Upper Right Button>
Caps Lock	<Func><Shift>
View Mode On/Off	<Func><Ctrl><Z>
Scroll Left	<Ctrl><Left>
Scroll Right	<Ctrl><Right>
Scroll Up	<Ctrl><Up>
Scroll Down	<Ctrl><Down>
Display Backlight On/Off	<Func><Z>
Keypad Backlight On/Off	<Func><X>
Contrast +	<Func><D>
Contrast -	<Func><I>
Volume +	<Func><H>
Volume -	<Func><M>

Table B-8. 3270 Emulation Keys

3270 Key	Key Sequence
Attention	<Ctrl><G>
Backspace	<BKSP>
Back Tab	<Ctrl><J>
Clear	<Esc>
Clear EOF	<Ctrl><K>
Delete	<Func><BKSP>
Dup	<Ctrl><D>
Enter	<Enter>
Erase Input	<Ctrl><E>
Field Mark	<Ctrl><F>
Home	<Func><*>
Insert	<Ctrl><H>
New Line	<Ctrl><N>
Reset	<Ctrl><O>
System Request	<Ctrl><L>
Tab	<Func><Space>
Left Arrow	<Left Arrow>
Right Arrow	<Right Arrow>
Up Arrow	<Up Arrow>
Down Arrow	<Down Arrow>
PA1	<Ctrl><A>
PA2	<Ctrl><B>
PA3	<Ctrl><C>
F1	<Func><1>
F2	<Func><2>
F3	<Func><3>

Table B-8. 3270 Emulation Keys (Continued)

3270 Key	Key Sequence
F4	<Func><4>
F5	<Func><5>
F6	<Func><6>
F7	<Func><7>
F8	<Func><8>
F9	<Func><9>
F10	<Func><0>
F11	<Shift><1>
F12	<Shift><2>
F13	<Shift><3>
F14	<Shift><4>
F15	<Shift><5>
F16	<Shift><6>
F17	<Shift><7>
F18	<Shift><8>
F19	<Shift><9>
F20	<Shift><0>
F21	<Ctrl><1>
F22	<Ctrl><2>
F23	<Ctrl><3>
F24	<Ctrl><4>

Table B-9. 3270 Character Map

Char	Key Sequence
Space	<space>
!	<Ctrl><5>
"	<Shift><Func><C>
#	<Ctrl><6>
$	<Ctrl><7>
%	<Ctrl><8>
&	<Ctrl><9>
'	<Func><C>
(	<Ctrl><0>
)	<Func><Ctrl><A>
*	<*>
+	<Func><S>
,	<Func><A>
-	<Func><T>
.	<.>
/	<Func><V>
0	<0>
1	<1>
2	<2>
3	<3>
4	<4>
5	<5>
6	<6>
7	<7>
8	<8>
9	<9>

Table B-9. 3270 Character Map

Char	Key Sequence
:	<Shift><Func><R>
;	<Func><R>
<	<Shift><Func><A>
=	<Func><W>
>	<Shift><Func><B>
?	<Func><Ctrl><G>
@	<Func><Ctrl><B>
A	<Shift><A>
B	<Shift><B>
C	<Shift><C>
D	<Shift><D>
E	<Shift><E>
F	<Shift><F>
G	<Shift><G>
H	<Shift><H>
I	<Shift><I>
J	<Shift><J>
K	<Shift><K>
L	<Shift><L>
M	<Shift><M>
N	<Shift><N>
O	<Shift><O>
P	<Shift><P>
Q	<Shift><Q>
R	<Shift><R>
S	<Shift><S>
T	<Shift><T>

Table B-9. 3270 Character Map

Char	Key Sequence
U	<Shift><U>
V	<Shift><V>
W	<Shift><W>
X	<Shift><X>
Y	<Shift><Y>
Z	<Shift><Z>
[	<Func><E>
\	<Func><G>
]	<Func><F>
^	<Func><Ctrl><E>
_	<Shift><Func><N>
`	<Func><J>
a	<A>
b	<B>
c	<C>
d	<D>
e	<E>
f	<F>
g	<G>
h	<H>
i	<I>
j	<J>
k	<K>
l	<L>
m	<M>
n	<N>
o	<O>

Table B-9. 3270 Character Map

Char	Key Sequence
p	<P>
q	<Q>
r	<R>
s	<S>
t	<T>
u	<U>
v	<V>
w	<W>
x	<X>
y	<Y>
z	<Z>
{	<Shift><Func><E>
|	<Shift><Func><G>
}	<Shift><Func><F>
~	<Shift><Func><J>

5250 Emulator

The 5250 emulator keypad contains a Power button, application keys, scroll keys and a function key. The 5250 emulator keypad uses the 53-key mapping when not in the emulator mode, see Table B-6 for descriptions for the 53-key mappings. The emulator mapping functions include:

- 5250 key functions
- 5250 emulation keys
- 5250 character map.

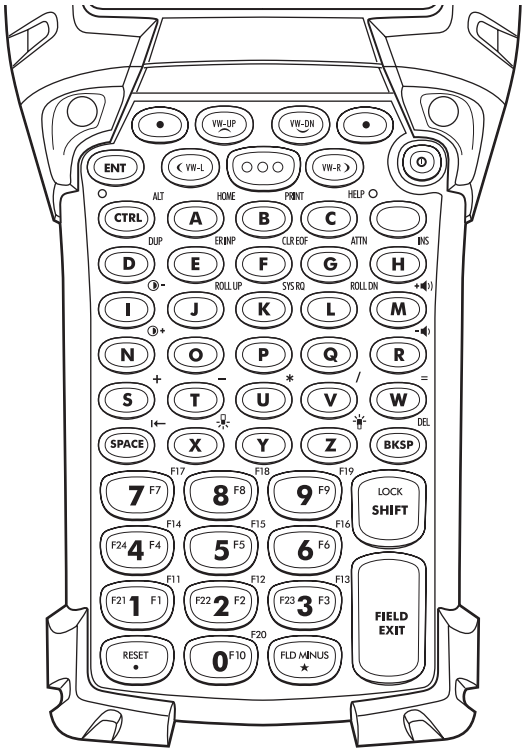


Figure B-5. 5250 Emulator Keypad

Table B-10. 5250 Key Functions

Local Function	**Key Sequence**
Program Information	<Func><Ctrl><P>
Diagnostics	<Func><Ctrl><D>
Keyclicks On/Off	<Func><Ctrl><K>
Quiet Mode On/Off	<Func><Ctrl><Q>
Terminal Configuration	<Func><Ctrl><C>
Host Profiles	<Func><Ctrl><R>
Message Recall	<Func><Ctrl><M>
Free Cursor Mode	<Func><Ctrl><F>
Close Session	<Func><Ctrl><T>
Previous Session	<Upper Left Button>
Next Session	<Upper Right Button>
Caps Lock	<Func><Shift>
View Mode On/Off	<Func><Ctrl><Z>
Scroll Left	<Ctrl><Left>
Scroll Right	<Ctrl><Right>
Scroll Up	<Ctrl><Up>
Scroll Down	<Ctrl><Down>
Display Backlight On/Off	<Func><Z>
Keypad Backlight On/Off	<Func><X>
Contrast +	<Func><D>
Contrast -	<Func><I>
Volume +	<Func><H>
Volume -	<Func><M>

Table B-11. 5250 Emulation Keys

5250 Key	Key Sequence
Attention	<Ctrl><G>
Backspace	<BKSP>
Back Tab	<Func><Space>
Clear	<Func><Ctrl><Shift><1>
Delete	<Func><BKSP>
Dup	<Ctrl><D>
Enter	<Ent>
Erase Input	<Ctrl><E>
Field Exit	<Field Exit>
Field Minus	<Func><*>
Help	<Ctrl><C>
Home	<Ctrl><A>
Insert	<Ctrl><H>
Print	<Ctrl><B>
Reset	<Func><.>
Roll Up	<Ctrl><J>
Roll Down	<Ctrl><L>
System Request	<Ctrl><K>
Tab	<Ctrl><I>
Left Arrow	<Left Arrow>
Right Arrow	<Right Arrow>
Up Arrow	<Up Arrow>
Down Arrow	<Down Arrow>
F1	<Func><1>
F2	<Func><2>
F3	<Func><3>

Table B-11. 5250 Emulation Keys (Continued)

5250 Key	Key Sequence
F4	<Func><4>
F5	<Func><5>
F6	<Func><6>
F7	<Func><7>
F8	<Func><8>
F9	<Func><9>
F10	<Func><0>
F11	<Shift><1>
F12	<Shift><2>
F13	<Shift><3>
F14	<Shift><4>
F15	<Shift><5>
F16	<Shift><6>
F17	<Shift><7>
F18	<Shift><8>
F19	<Shift><9>
F20	<Shift><0>
F21	<Ctrl><1>
F22	<Ctrl><2>
F23	<Ctrl><3>
F24	<Ctrl><4>

Table B-12. 5250 Character Map

Char	Key Sequence
Space	<space>
!	<Ctrl><5>
"	<Shift><Func><C>
#	<Ctrl><6>
$	<Ctrl><7>
%	<Ctrl><8>
&	<Ctrl><9>
'	<Func><C>
(	<Ctrl><0>
)	<Func><Ctrl><A>
*	<*>
+	<Func><S>
,	<Func><A>
-	<Func><T>
.	<.>
/	<Func><V>
0	<0>
1	<1>
2	<2>
3	<3>
4	<4>
5	<5>
6	<6>
7	<7>
8	<8>
9	<9>

Table B-12. 5250 Character Map

Char	Key Sequence
:	<Shift><Func><R>
;	<Func><R>
<	<Shift><Func><A>
=	<Func><W>
>	<Shift><Func><B>
?	<Func><Ctrl><G>
@	<Func><Ctrl><B>
A	<Shift><A>
B	<Shift><B>
C	<Shift><C>
D	<Shift><D>
E	<Shift><E>
F	<Shift><F>
G	<Shift><G>
H	<Shift><H>
I	<Shift><I>
J	<Shift><J>
K	<Shift><K>
L	<Shift><L>
M	<Shift><M>
N	<Shift><N>
O	<Shift><O>
P	<Shift><P>
Q	<Shift><Q>
R	<Shift><R>
S	<Shift><S>
T	<Shift><T>

Table B-12. 5250 Character Map

Char	Key Sequence
U	<Shift><U>
V	<Shift><V>
W	<Shift><W>
X	<Shift><X>
Y	<Shift><Y>
Z	<Shift><Z>
[	<Func><E>
\	<Func><G>
]	<Func><F>
^	<Func><Ctrl><E>
_	<Shift><Func><N>
`	<Func><J>
a	<A>
b	<B>
c	<C>
d	<D>
e	<E>
f	<F>
g	<G>
h	<H>
i	<I>
j	<J>
k	<K>
l	<L>
m	<M>
n	<N>
o	<O>

Table B-12. 5250 Character Map

Char	Key Sequence
p	<P>
q	<Q>
r	<R>
s	<S>
t	<T>
u	<U>
v	<V>
w	<W>
x	<X>
y	<Y>
z	<Z>
{	<Shift><Func><E>
|	<Shift><Func><G>
}	<Shift><Func><F>
~	<Shift><Func><J>

VT Emulator Keypad

The VT Emulator keypad contains a Power button, application keys, scroll keys and a function key. The VT emulator keypad uses the 53-key mapping when not in the emulator mode, see Table B-6 for descriptions for the 53-key mappings. The emulator mapping functions include:

- VT key functions
- VT-100 emulation keys
- VT-220 emulation keys
- VT/HP character map.

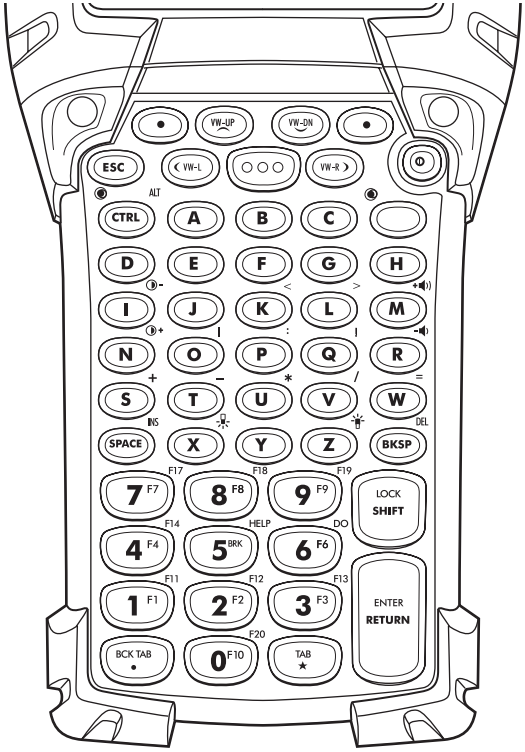


Figure B-6. VT Emulator Keypad

Table B-13. VT Terminal Functions

VT Function	Key Sequence
Program Information	<Func><Ctrl><P>
Diagnostics	<Func><Ctrl><D>
Keyclicks On/Off	<Func><Ctrl><K>
Quiet Mode	<Func><Ctrl><Q>
Terminal Configuration	<Func><Ctrl><C>
Host Profiles	<Func><Ctrl><R>
Close Session	<Func><Ctrl><T>
Previous Session	<Func><Ctrl><Shift><1>
Next Session	<Func><Ctrl><Shift><3>
Caps Lock	<Func><Shift>
View Mode On/Off	<Func><Ctrl><Z>
Scroll Left	<Ctrl><Left>
Scroll Right	<Ctrl><Right>
Scroll Up	<Ctrl><Up>
Scroll Down	<Ctrl><Down>
Display Backlight On/Off	<Func><Z>
Keypad Backlight On/Off	<Func><X>
Contrast +	<Func><D>
Contrast -	<Func><I>
Volume +	<Func><H>
Volume -	<Func><M>

Table B-14. VT-100 Emulation Keys

VT-100 Key	Key Sequence
Return	<Return>
Backspace	<BKSP>
Tab	<Func><*>
Up Arrow	<Up Arrow>
Left Arrow	<Left Arrow>
ESC	<Esc>
BS	<BKSP>
LF	<Ctrl><J>
Hard Terminal Reset	<Func><Ctrl><H>
Enter	<Return>
Backspace(Delete)	<BKSP>
Backtab	<Func><.>
Down Arrow	<Down Arrow>
Right Arrow	<Right Arrow>
PF1	<Func><1>
PF2	<Func><2>
PF3	<Func><3>
PF4	<Func><4>

Table B-15. VT-220 Emulation Keys

VT-220 Key	Key Sequence
Return	<Return>
Backspace	<BKSP>
Tab	<Func><*>
Up Arrow	<Up Arrow>
Left Arrow	<Left Arrow>
Hard Terminal Reset	<Func><Ctrl><H>
Find	<Func><Ctrl><Left>
Insert Here	<Func><Space>
Prev Screen	<Func><Ctrl><Shift><4>
PF1	<Func><1>
PF2	<Func><2>
PF3	<Func><3>
PF4	<Func><4>
BREAK1	<Func><5>
F6	<Func><6>
F7	<Func><7>
F8	<Func><8>
F9	<Func><9>
F10	<Func><0>
F11	<Shift><1>
F12	<Shift><2>
F13	<Shift><3>
F14	<Shift><4>
F15/Help	<Shift><5>
F16/Do	<Shift><6>
F17	<Shift><7>

Table B-15. VT-220 Emulation Keys (Continued)

VT-220 Key	Key Sequence
F18	<Shift><8>
F19	<Shift><9>
F20	<Shift><0>
Enter	<Return>
Backspace(Delete)	<Ctrl><BKSP>
Backtab	<Func><.>
Down Arrow	<Down Arrow>
Right Arrow	<Right Arrow>
Soft Terminal Reset	<Func><Ctrl><S>
Select	<Func><Ctrl><Shift><5>
Remove	<Func><Ctrl><Shift><7>
Next Screen	<Func><Ctrl><Shift><6>

Table B-16. VT/HP Character Map

Char	Key Sequence
^@	
^A	<Ctrl><A>
^B	<Ctrl><B>
^C	<Ctrl><C>
^D	<Ctrl><D>
^E	<Ctrl><E>
^F	<Ctrl><F>
^G	<Ctrl><G>
^H	<Ctrl><H>
^I	<Ctrl><I>
^J	<Ctrl><J>
^K	<Ctrl><K>
^L	<Ctrl><L>
^M	<Ctrl><M>
^N	<Ctrl><N>
^O	<Ctrl><O>
^P	<Ctrl><P>
^Q	<Ctrl><Q>
^R	<Ctrl><R>
^S	<Ctrl><S>
^T	<Ctrl><T>
^U	<Ctrl><U>
^V	<Ctrl><V>
^W	<Ctrl><W>
^X	<Ctrl><X>
^Y	<Ctrl><Y>

Table B-16. VT/HP Character Map

Char	Key Sequence
^Z	<Ctrl><Z>
ESC	<ESC>
^\	<Ctrl><1>
^]	<Ctrl><2>
^^	<Ctrl><3>
^_	<Ctrl><4>
Space	<space>
!	<Func><Q>
"	<Shift><Func><C>
#	<Ctrl><6>
$	<Ctrl><7>
%	<Ctrl><8>
&	<Ctrl><9>
'	<Func><C>
(	<Ctrl><0>
)	<Func><Ctrl><A>
*	<*>
+	<Func><S>
,	<Func><A>
-	<Func><T>
.	<.>
/	<Func><V>
0	<0>
1	<1>
2	<2>
3	<3>
4	<4>

Table B-16. VT/HP Character Map

Char	Key Sequence
5	<5>
6	<6>
7	<7>
8	<8>
9	<9>
:	<Func><P>
;	<Func><R>
<	<Func><K>
=	<Func><W>
>	<Func><L>
?	<Func><Ctrl><G>
@	<Func><Ctrl><B>
A	<Shift><A>
B	<Shift><B>
C	<Shift><C>
D	<Shift><D>
E	<Shift><E>
F	<Shift><F>
G	<Shift><G>
H	<Shift><H>
I	<Shift><I>
J	<Shift><J>
K	<Shift><K>
L	<Shift><L>
M	<Shift><M>
N	<Shift><N>
O	<Shift><O>

Table B-16. VT/HP Character Map

Char	Key Sequence
P	<Shift><P>
Q	<Shift><Q>
R	<Shift><R>
S	<Shift><S>
T	<Shift><T>
U	<Shift><U>
V	<Shift><V>
W	<Shift><W>
X	<Shift><X>
Y	<Shift><Y>
Z	<Shift><Z>
[	<Func><E>
\	<Func><G>
]	<Func><F>
^	<Func><Ctrl><E>
_	<Shift><Func><N>
`	<Func><J>
a	<A>
b	<B>
c	<C>
d	<D>
e	<E>
f	<F>
g	<G>
h	<H>
I	<I>
j	<J>

Table B-16. VT/HP Character Map

Char	Key Sequence
k	<K>
l	<L>
m	<M>
n	<N>
o	<O>
p	<P>
q	<Q>
r	<R>
s	<S>
t	<T>
u	<U>
v	<V>
w	<W>
x	<X>
y	<Y>
z	<Z>
{	<Shift><Func><E>
|	<Func><O>
}	<Shift><Func><F>
~	<Shift><Func><J>

28-Key Keypad (MC9000-S)

The 28-key keypad contains a Power button, application keys, scroll keys and a function key. See Table B-3 for key functions and Table B-4 for the keypad mappings. The mapping functions include:

- 28-key functions
- 28-key character map.

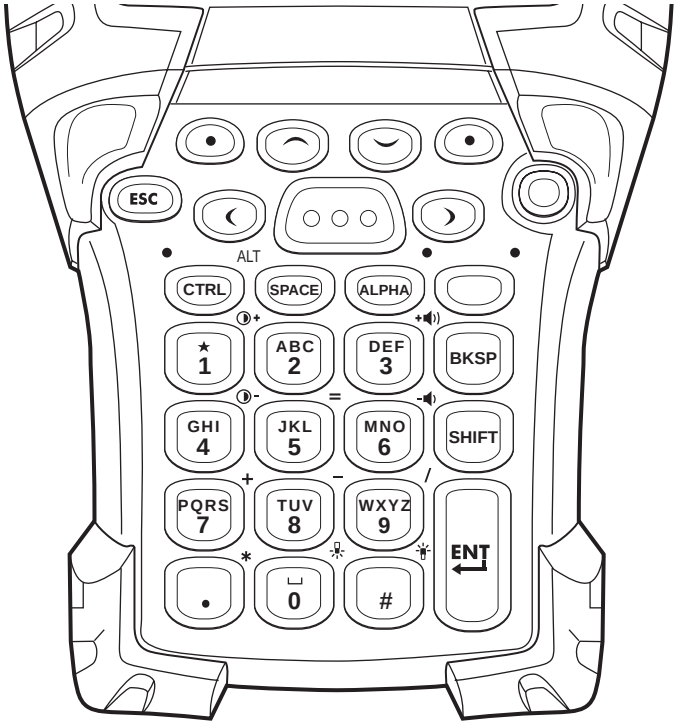


Figure B-7. MC9000-S: 28-Key Keypad

Table B-17. MC9000-S: 28-Key Functions

Local Function	Key Sequence
Display Backlight On/Off	<Func><#>
Keypad Backlight On/Off	<Func><0>
Contrast +	<Func><1>
Contrast -	<Func><4>
Volume +	<Func><3>
Volume -	<Func><6>

Table B-18. MC9000-S: 28 Key Keypad Mapping

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	1												49	49
		*											106	42
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	2												50	50
		a											65	97
			b										66	98
				c									67	99
						A							160+65	65
							B						160+66	66
								C					160+67	67

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	3												51	51
		d											68	100
			e										69	101
				f									70	102
						D							160+68	68
							E						160+69	69
								F					160+70	70
											 *			
												 *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	4												52	52
		g											71	103
			h										72	104
				i									73	105
						G							160+71	71
							H						160+72	72
								I					160+73	73
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	5												53	53
		j											74	106
			k										75	107
				l									76	108
						J							160+74	74
							K						160+75	75
								L					160+76	76
										5			53	53
											=		187	61
												+	160+187	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	6												54	54
		m											77	109
			n										78	110
				o									79	111
						M							160+77	77
							N						160+78	78
								O					160+79	79
											 *			
												 *		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	7												55	55
		p											80	112
			q										81	113
				r									82	114
					s								83	115
						P							160+80	80
							Q						160+81	81
								R					160+82	82
									S				160+83	83
											+		107	43
												+	160+107	43

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	8												56	56
		t											84	116
			u										85	117
				v									86	118
						T							160+84	84
							U						160+85	85
								V					160+86	86
											-		189	45
												-	160+189	45

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

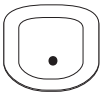
Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	9												57	57
		w											87	119
			x										88	120
				y									89	121
					z								90	122
						W							160+87	87
							X						160+88	88
								Y					160+89	89
									Z				160+90	90
											/		191	47
												/	160+191	47

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	.												190	46
											*		106	42
												*	160+106	42

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

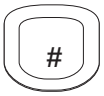
Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	0												48	48
		Space											32	32
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	#												160+51	35
											*			
												*		

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Space												32	32

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	BKSP												8	8

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Up												38	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Down												40	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Right												39	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Table B-18. MC9000-S: 28 Key Keypad Mapping (Continued)

Key	Default State	Alpha State (1 Tap)	Alpha State (2 Taps)	Alpha State (3 Taps)	Alpha State (4 Taps)	Shift Alpha State (1 Tap)	Shift Alpha State (2 Taps)	Shift Alpha State (3 Taps)	Shift Alpha State (4 Taps)	Ctrl State	Funct State	Shift-Func State	VK Code (Decimal)	ASCII Value (Decimal)
	Left												37	-

* See Table 2-7 on page 2-23 for keypad special functions.

Note: Blank lines are provided to allow the application developer to use this table as a keypad mapping worksheet.

Glossary

802.11/802.11b

A radio protocol that may be used by the Symbol Spectrum24 radio card. Symbol radio cards that use the 802.11 protocol also have an ESS_ID.

ACK/NAK

ACK/NAK is the default software handshaking.

Access Point

Access Point (AP) refers to Symbol's Spectrum24 Ethernet Access Point. It is a piece of communications equipment that manages communications between the host computer system and one or more wireless terminals. An AP connects to a wired Ethernet LAN and acts as a bridge between the Ethernet wired network and IEEE 802.11 interoperable radio-equipped mobile units, such as a mobile computer. The AP allows a mobile user to roam freely through a facility while maintaining a seamless connection to the wired network.

AirBEAM® Manager	AirBEAM® Manager is a comprehensive wireless network management system that provides essential functions that are required to configure, monitor, upgrade and troubleshoot the Spectrum24® wireless network and its components (including networked mobile computers). Some features include event notification, access point configuration, diagnostics, statistical reports, auto-discovery, wireless proxy agents and monitoring of access points and mobile units.
AirBEAM® Smart Client	AirBEAM® Smart Client is part of Symbol's AirBEAM® suite, which also includes AirBEAM® Safe and AirBEAM® Manager. The AirBEAM® Smart Client system uses the network accessible host server to store software files that are to be downloaded to the mobile computers. The AirBEAM® Smart Client provides the mobile computers with the "smarts" to request software from the host. It allows them to request, download and install software, as well as to upload files and status data. The AirBEAM® Smart Client uses the industry standard FTP or TFTP file transfer protocols to check the host system for updates, and if necessary, to transfer updated software. Most often, AirBEAM® Smart Client is used with wireless networks, but any TCP/IP connection can be used. For more information, refer to the AirBEAM® Smart Windows® CE Client Product Reference Guide (p/n 72-63060-xx).
AP	See **Access Point**.
API	An interface by means of which one software component communicates with or controls another. Usually used to refer to services provided by one software component to another, usually via software interrupts or function calls
Aperture	The opening in an optical system defined by a lens or baffle that establishes the field of view.
Application Programming Interface	See **API**.
ANSI Terminal	A display terminal that follows commands in the ANSI standard terminal language. For example, it uses escape sequences to control the cursor, clear the screen and set colors. Communications programs support the ANSI terminal mode and often default to this terminal emulation for dial-up connections to online services.

ASCII	American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks and control characters. It is a standard data transmission code in the U.S.
Autodiscrimination	The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content is decoded.
Bar	The dark element in a printed bar code symbol.
Bar Code	A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See **Symbology**.
Bar Code Density	The number of characters represented per unit of measurement (e.g., characters per inch).
Bar Height	The dimension of a bar measured perpendicular to the bar width.
Bar Width	Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.
Baud Rate	A measure of the data flow or number of signaling events occurring per second. When one bit is the standard "event," this is a measure of bits per second (bps). For example, a baud rate of 50 means transmission of 50 bits of data per second.
BIOS	Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.
Bit	Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.
Bits per Second (bps)	Bits transmitted or received.

Bit	Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.
bps	See **Bits Per Second**.
Byte	On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory is used to store one ASCII character.
BOOTP	A protocol for remote booting of diskless devices. Assigns an IP address to a machine and may specify a boot file. The client sends a bootp request as a broadcast to the bootp server port (67) and the bootp server responds using the bootp client port (68). The bootp server must have a table of all devices, associated MAC addresses and IP addresses.
boot or boot-up	The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.
CDMA	Code Division Multiple Access is a cellular technology originally know as IS-95.
CDRH	Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.
CDRH Class 1	This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.
CDRH Class 2	No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.
Cellular Digital Packet Data	See **CDPD**.
Character	A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set — Those characters available for encoding in a particular bar code symbology.

Check Digit — A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar — A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- $: / , +).

Code 128 — A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39) — A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters (- . / + % $ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93 — An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length — Number of data characters in a bar code between the start and stop characters, not including those characters.

Cold Boot — A cold boot restarts the mobile computer and erases all user stored records and entries.

COM port — Communication port; ports are identified by number, e.g., COM1, COM2.

Continuous Code — A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

Cradle — A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.

Data Communications Equipment (DCE)	A device (such as a modem) which is designed to attach directly to a DTE (Data Terminal Equipment) device.
DCE	See **Data Communications Equipment**.
DCP	See **Device COnfiguration Package**.
Dead Zone	An area within a scanner's field of view, in which specular reflection may prevent a successful decode.
Decode	To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.
Decode Algorithm	A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.
Decryption	Decryption is the decoding and unscrambling of received encrypted data. Also see, **Encryption** and **Key**.
Depth of Field	The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.
Device Configuration Package	The Symbol Device Configuration Pacage provides the Product Reference Guide (PRG), flash partitions, Terminal Configuration Manager (TCM) and the associated TCM scripts. With this package hex images that represent flash partitions can be created and downloaded to the mobile computer.
DHCP	(Dynamic Host Configuration Protocol) Software that automatically assigns IP addresses to client stations logging onto a TCP/IP network. Similar to BOOTP, but also permits the leasing of an IP address. It eliminates having to manually assign permanent IP addresses. DHCP software typically runs in servers and is also found in network devices such as routers that allow multiple users access to the Internet.
DHCP Server	A server in the network or a service within a server that assigns IP addresses.
Discrete Code	A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.

Discrete 2 of 5 — A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.

DNS Server — The Control Panel allows you to set the IP address for a DNS Server, if used. This allows users to use server names, rather than IP addresses. It is set on the Network tab of the Control Panel.

Domain Name — The Control Panel allows you to set a Domain Name for the DNS Server, if used (*e.g.*, symbol.com). It is set on the Network tab of the Control Panel.

DOS — Disk Operating System. This is basic software that allows you to load and use software applications on your computer. Also see **NetID**.

DRAM — Dynamic random access memory.

DTE — See **Data Terminal Equipment**.

EAN — European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

Element — Generic term for a bar or space.

Encoded Area — Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

ENQ (RS-232) — ENQ software handshaking is also supported for the data sent to the host.

Encryption — Encryption is the scrambling and coding of data, typically using mathematical formulas called algorithms, before information is transmitted over any communications link or network. A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, **Decryption** and **Key**.

ESD — Electro-Static Discharge

ESS_ID

Extended Service Set Identifier, defines the coverage area. Prior to the release of the 802.11 specification the ESS_ID was called the Net_ID or Network Identifier. For terminals using Spectrum24 radios with the 802.11 protocol, an ESS_ID allows facilities to limit which Access Points a mobile computer can communicate with. It is set on the Network tab of the Control Panel. The terminal can only communicate with Spectrum24 Access Points that have matching ESS_IDs.

Ethernet

Ethernet communication port. Allows a wired interface to a radio network.

Flash Disk

An additional megabyte of non-volatile memory for storing application and configuration files.

Flash Memory

Flash memory is nonvolatile, semi-permanent storage that can be electronically erased in the circuit and reprogrammed. Series 9000 mobile computers use Flash memory to store the operating system (ROM-DOS), the terminal emulators, and the Citrix ICA Client for DOS.

File Transfer Protocol (FTP)

A TCP/IP application protocol governing file transfer via network or telephone lines. See **TCP/IP.**

Frequency Hopping

The use of a random sequence of frequency channels to achieve spread spectrum compliance. Stations that use frequency hopping change their communications frequency at regular intervals. A hopping sequence determines the pattern at which frequencies are changed. Messages take place within a hop. See **Hopping Sequence** and **Spread Spectrum**.

FTP

See **File Transfer Protocol**.

Flash Memory

Flash memory is responsible for storing the system firmware and is non-volatile. If the system power is interrupted the data is not lost.

Gateway Address

An IP address for a network gateway or router. A mobile computer may be part of a subnet as specified by its IP address and Netmask. It can send packets directly to any node on the same subnet. If the destination node is on a different subnet, then the terminal sends the packet to the gateway first. The gateway determines how to route the packet to the destination subnet. This field is an option used by networks that require gateways.

Hard Reset	See **Cold Boot**.
Hopping Sequence	A set of random frequencies designed to minimize interference with other sets of random frequencies. A hopping sequence determines the pattern with which a station that uses frequency hopping changes its communications frequency. See **Frequency Hopping**.
Hz	Hertz; A unit of frequency equal to one cycle per second.
Host Computer	A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.
IDE	Intelligent drive electronics. Refers to the solid-state hard drive type.
IEC	International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.
IEC (825) Class 1	This is the lowest power IEC laser classification. Conformity is ensured through a software restriction of 120 seconds of laser operation within any 1000 second window and an automatic laser shutdown if the scanner's oscillating mirror fails.
IEEE Address	See **MAC Address**.
Interleaved 2 of 5	A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.
IOCTL	Input/Output Control.
IP	Internet Protocol.
imaging scanning	Mobile computers with an integrated imager use digital camera technology to take a digital picture of a bar code, store the resulting image in memory and execute state-of-the-art software decoding algorithms to extract the data from the image.

Intercharacter Gap The space between two adjacent bar code characters in a discrete code.

Interleaved Bar Code A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

Interleaved 2 of 5 A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Internet Protocol Address See **IP**.

I/O Ports interface The connection between two devices, defined by common physical characteristics, signal characteristics, and signal meanings. Types of interfaces include RS-232 and PCMCIA.

Input/Output Ports I/O ports are primarily dedicated to passing information into or out of the terminal's memory. Series 9000 mobile computers include Serial and USB ports.

IP (Internet Protocol) The IP part of the TCP/IP communications protocol. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or subnetwork. IP accepts "packets" from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a "datagram" to the layer 2 data link protocol. It may also break the packet into fragments to support the maximum transmission unit (MTU) of the network.

IP Address (Internet Protocol address) The address of a computer attached to an IP network. Every client and server station must have a unique IP address. A 32-bit address used by a computer on a IP network. Client workstations have either a permanent address or one that is dynamically assigned to them each session. IP addresses are written as four sets of numbers separated by periods; for example, 204.171.64.2.

IPX/SPX Internet Package Exchange/Sequential Packet Exchange. A communications protocol for Novell. IPX is Novell's Layer 3 protocol, similar to XNS and IP, and used in NetWare networks. SPX is Novell's version of the Xerox SPP protocol.

Kerberos

Kerberos is a network authentication protocol. It is designed to provide strong authentication for client/server applications by using secret-key cryptography. A free implementation of this protocol is available from the Massachusetts Institute of Technology. Kerberos is available in many commercial products as well.

Key

A key is the specific code used by the algorithm to encrypt or decrypt the data. Also see, **Encryption** and **Decrypting**.

LAN

Local area network. A radio network that supports data communication within a local area, such as within a warehouse of building.

laser scanner

A type of bar code reader that uses a beam of laser light.

LASER

Light Amplification by Stimulated Emission of Radiation.The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode

A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

LCD

See **Liquid Crystal Display**.

LED Indicator

A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.

Liquid Crystal Display (LCD)

A display that uses liquid crystal sealed between two glass plates. The crystals are excited by precise electrical charges, causing them to reflect light outside according to their bias. They use little electricity and react relatively quickly. They require external light to reflect their information to the user.

Light Emitting Diode

See **LED**.

MAC Address (also called IEEE Address)

Spectrum24® devices, like other Ethernet devices, have unique, hardware-encoded MAC (also called IEEE addresses). MAC addresses determine the device sending or receiving data. The MAC address is a 48-bit number written as six hexadecimal bytes separated by colons.

MC	Mobile Computer.
MIL	1 mil = 1 thousandth of an inch.
Misread (Misdecode)	A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.
Mobile Computer	In this text, *mobile computer* refers to the Symbol Series 9000 wireless portable computer. It can be set up to run as a stand-alone device, or it can be set up to communicate with a network, using wireless radio technology.
NCU	Network Control Unit.
NetBeui	A non-routable LAN protocol that is an extension to NetBIOS. Used for IBM's OS/2-based LAN Manager and Microsoft's LAN Manager and Windows for Workgroups.
NetID	For terminals using Spectrum24 radios with the Spring protocol, a NetID allows facilities to limit which Access Points a mobile computer can communicate with. It is set on the Network tab of the Control Panel. The terminal can only communicate with Spectrum24 Access Points that have matching NetIDs. Also see **ESS_ID**.
Nominal	The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.
Nominal Size	Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).
Null Modem Cable	An RS-232 cable used to connect two personal computers together in close proximity for file transfer. It attaches to the serial ports of both machines and simulates what would occur naturally if modems and the phone system were used. It crosses the sending wire with the receiving wire.
NVM	Non-Volatile Memory.
ODI	See **Open Data-Link Interface**.

Open Data-Link Interface (ODI)

Novell's driver specification for an interface between network hardware and higher-level protocols. It supports multiple protocols on a single NIC (Network Interface Controller). It is capable of understanding and translating any network information or request sent by any other ODI-compatible protocol into something a NetWare client can understand and process.

Open System Authentication

Open System authentication is a null authentication algorithm.

PAN

Personal area network. Using Bluetooth wireless technology, PANs enable devices to communicate wirelessly. Generally, a wireless PAN consists of a dynamic group of less than 255 devices that communicate within about a 33-foot range. Only devices within this limited area typically participate in the network.

Parameter

A variable that can have different values assigned to it.

PC Card

A plug-in expansion card for laptop computers and other devices, also called a PCMCIA card. PC Cards are 85.6mm long x 54 mm wide, and have a 68 pin connector. There are several different kinds:

Type I; 3.3 mm high; use - RAM or Flash RAM

Type II; 5 mm high; use - modems, LAN adaptors

Type III; 10.5 high; use - Hard Disks

PCMCIA

Personal Computer Memory Card Interface Association. See **PC Card**.

PDT

Portable Data Terminal.

Percent Decode

The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.

PING

(Packet Internet Groper) An Internet utility used to determine whether a particular IP address is online. It is used to test and debug a network by sending out a packet and waiting for a response.

Print Contrast Signal (PCS)

Measurement of the contrast (brightness difference) between the bars and spaces of a symbol. A minimum PCS value is needed for a bar code symbol to be scannable. PCS = (RL - RD) / RL, where RL is the reflectance factor of the background and RD the reflectance factor of the dark bars.

Programming Mode	The state in which a scanner is configured for parameter values. See **Scanning Mode**.
Quiet Zone	A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.
QWERTY	A standard keyboard commonly used on North American and some European PC keyboards. "QWERTY" refers to the arrangement of keys on the left side of the third row of keys.
RAM	Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.
Reflectance	Amount of light returned from an illuminated surface.
Resolution	The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.
RF	Radio Frequency.
ROM	Read-Only Memory. Data stored in ROM cannot be changed or removed.
ROM-DOS	The name of the licensed Disk Operating System loaded into the terminal's flash file system.
Router	A device that connects networks and supports the required protocols for packet filtering. Routers are typically used to extend the range of cabling and to organize the topology of a network into subnets. See **Subnet**.
RS-232	An Electronic Industries Association (EIA) standard that defines the connector, connector pins, and signals used to transfer data serially from one device to another.
Scan Area	Area intended to contain a symbol.
Scanner	An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: 1. Light source (laser or photoelectric cell) - illuminates a bar code. 2. Photodetector - registers the difference in reflected light (more light reflected from spaces). 3. Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode	The scanner is energized, programmed and ready to read a bar code.
Scanning Sequence	A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.
SMDK	Software MobilityDevelopment Kit
Self-Checking Code	A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.
Shared Key	Shared Key authentication is an algorithm where both the AP and the MU share an authentication key.
SHIP	Symbol Host Interface Program.
SMDK	Symbol Mobility Developer Kit.
Soft Reset	See **Warm Boot**.
Space	The lighter element of a bar code formed by the background between bars.
Spectrum24	Symbol's frequency-hopping, spread spectrum cellular network.
Spectrum One	Symbol's implementation of the Spread Spectrum wireless network, utilizing direct sequencing.
Specular Reflection	The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.
Spread Spectrum	A technique for uniformly distributing the information content of a radio signal over a frequency range larger than normally required for robust transmission of data. Spreading the signal without adding additional information adds significant redundancy, which allows the data to be recovered in the presence of strong interfering signals such as noise and jamming signals. The primary advantage of spread spectrum technology is its ability to provide robust communications in the presence of interfering signals.
Spring Radio Protocol	A radio protocol that may be used by the Symbol Spectrum24 radio card. Symbol Radio cards that use the Spring protocol also have an Net ID.
Start/Stop Character	A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

STEP	Symbol Terminal Enabler Program.
Subnet	A subset of nodes on a network that are serviced by the same router. See **Router**.
Subnet Mask	A 32-bit number used to separate the network and host sections of an IP address. A custom subnet mask subdivides an IP network into smaller subsections. The mask is a binary pattern that is matched up with the IP address to turn part of the host ID address field into a field for subnets. Default is often 255.255.255.0.
Substrate	A foundation material on which a substance or image is placed.
SVTP	Symbol Virtual Terminal Program.
Symbol	A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.
Symbol Aspect Ratio	The ratio of symbol height to symbol width.
Symbol Height	The distance between the outside edges of the quiet zones of the first row and the last row.
Symbol Length	Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.
Symbology	The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

TCP/IP	(Transmission Control Protocol/Internet Protocol) A communications protocol used to internetwork dissimilar systems. This standard is the protocol of the Internet and has become the global standard for communications. TCP provides transport functions, which ensures that the total amount of bytes sent is received correctly at the other end. UDP is an alternate transport that does not guarantee delivery. It is widely used for real-time voice and video transmissions where erroneous packets are not retransmitted. IP provides the routing mechanism. TCP/IP is a routable protocol, which means that all messages contain not only the address of the destination station, but the address of a destination network. This allows TCP/IP messages to be sent to multiple networks within an organization or around the world, hence its use in the worldwide Internet. Every client and server in a TCP/IP network requires an IP address, which is either permanently assigned or dynamically assigned at startup.
Telnet	A terminal emulation protocol commonly used on the Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.
Terminal	See **Mobile Computer**.
Terminate and Stay Resident (TSR)	A program under DOS that ends its foreground execution to remain resident in memory to service hardware/software interrupts, providing background operation. It remains in memory and may provide services on behalf of other DOS programs.
Terminal Emulation	A "terminal emulation" emulates a character-based mainframe session on a remote non-mainframe terminal, including all display features, commands and function keys. The MC9000 Series supports Terminal Emulations in 3270, 5250 and VT220.
TFTP	(Trivial File Transfer Protocol) A version of the TCP/IP FTP (File Transfer Protocol) protocol that has no directory or password capability. It is the protocol used for upgrading firmware, downloading software and remote booting of diskless devices.
Tolerance	Allowable deviation from the nominal bar or space width.
Transmission Control Protocol/Internet Protocol	See **TCP/IP.**

Trivial File Transfer Protocol	See **TFTP.**
TSR	See **Terminate and Stay Resident**.
UPC	Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which is any of four widths. The standard symbology for retail food packages in the United States.
UDP	User Datagram Protocol. A protocol within the IP protocol suite that is used in place of TCP when a reliable delivery is not required. For example, UDP is used for real-time audio and video traffic where lost packets are simply ignored, because there is no time to retransmit. If UDP is used and a reliable delivery is required, packet sequence checking and error notification must be written into the applications.
Visible Laser Diode (VLD)	A solid state device which produces visible laser light.
WAN	Wide-Area Network. A radio network that supports data communication beyond a local area. That is, information can be sent across a city, state, or even nationwide.
Warm Boot	A warm boot restarts the mobile computer by closing all running programs. All data that is not saved to flash memory is lost.
WEP	Wired Equivalent Privacy, is specified by IEEE for encryption and decryption of RF (wireless) communications.
WEP Encryption	(Wired Equivalent Privacy encryption) The conversion of data into a secret code for transmission over a public network. The original text, or plaintext, is converted into a coded equivalent called ciphertext via an encryption algorithm. The ciphertext is decoded (decrypted) at the receiving end and turned back into plaintext. The encryption algorithm uses a key, which is a binary number that is typically from 40 to 128 bits in length. The greater the number of bits in the key (cipher strength), the more possible key combinations and the longer it would take to break the code. The data is encrypted, or "locked," by combining the bits in the key mathematically with the data bits. At the receiving end, the key is used to "unlock" the code and restore the original data.
Wireless Local Area Network (WLAN)	See **LAN**.
Wireless Wide Area Network (WWAN)	See **WAN**.

WNMP (Wireless Network Management Protocol) This is Symbol's proprietary MAC layer protocol used for inter access point communication and other MAC layer communication.

WNMS (was renamed to AirBEAM® Manager) See **AirBEAM® Manager**.

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72-65262-03
Revision A — June 2004